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## Contents

	PAGE
Editorial Notes: The Chemist and the State; U.S. Potash Deposits; An Expert Licensing Committee	363
The Calendar	365
Individual Characteristics of Some Edible Oils. By A. A. POLLITT, M.Sc.	366
Reviews	368
American Chemical Society's Annual Meeting: Some Impressions. By Dr. HUGH S. TAYLOR	369
American Chemical Notes	371
Artificial Leather	372
British Chemical Trades' Association	374
Alsatian Potash	375
From Week to Week	378
References to Current Literature...	379
Patent Literature	380
Company News	383
Market Report and Current Prices	384
Commercial Intelligence	386

**NOTICES:**—All communications relating to editorial matter should be addressed to the Editor, who will be pleased to consider articles or contributions dealing with modern chemical developments or suggestions bearing upon the advancement of the chemical industry in this country. Communications relating to advertisements or general matters should be addressed to the Manager.

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## The Chemist and the State

THE fifth Report of the Department of Scientific and Industrial Research, an abstract of which we published last week, appears to have lent itself to a certain amount of criticism, more especially in so far as the Department is concerned with the education and supply of trained scientific workers, and the freedom of action which is apparently denied to those who wish to engage in industrial research work at the expense of the State. It should be recalled that the considerable sums of money allocated to the Department have been provided for the express purpose of encouraging research work by individuals, for the training of capable students in original investigation, for the organisation of research national purposes, and for the development of research work in the country's staple industries. New Research Associations continue to be licensed by the Department, the total up to date being 18, while five others have recently been approved. In this direction, therefore, the work of the Department is

certainly ambitious; but, on its own confession, the Advisory Council appears to have overlooked the fact that it was also convened for "the express purpose of training capable students." As an ordinary business proposition it would seem that a necessary preliminary to the establishment of special centres and laboratories would be the collocation of a suitable supply of trained workers which could be drawn upon to meet the needs of the problems in hand and in prospect. It is found, however, that while research centres have been established, there is considerable difficulty in securing staffs of the required ability to operate them. The situation would be almost amusing if it were not tragic, and it shows symptoms of an over-zealous attempt to build up an elaborate superstructure on inadequate foundations. To add to the difficulty, the Department points out that it cannot increase the supply of original workers or assist in encouraging greater output by making grants to the available training-grounds; for the duty of making grants to the universities falls to "other authorities." In other words, the Department does not appear to have a free hand in discharging the first and most important of its duties.

Another regulation of the Department about which considerable doubt is felt is that which largely deprives the research worker of the fruits of his own labours. All inventions or discoveries, in fact, must be communicated to members of the Research Association only, the Association retaining the proprietary rights. Such a policy must assuredly defeat its own object in the long run. The research chemist knows by experience that he can never expect to do more than make both ends meet on the usual standing salary he is paid; so that, in cases where he preserves his freedom, he realises that provision for the future and a more generous enjoyment of life depends largely on his ability to discover processes having a definite commercial value. The knowledge of this adds zest to his work, and though some may pursue science for mere pleasure and interest, we are afraid that to the majority the prospect of wealth is just as alluring as the prospect of fame. A policy which tends to destroy individualism and to vest discovery in closed corporations is strongly to be deprecated as a direct inducement towards the destruction of originality and personal effort; and it is gratifying to note that the whole question (page 86) is to be reconsidered by a special Inter-Departmental Committee. Particular attention is to be given to the question of discoveries made by State-aided or maintained workers, with the object of devising a scheme whereby the inventor shall receive a fair reward and be encouraged to further effort. Much depends, of course, upon the official interpretation of the seductive but elusive phrase—"a fair reward,"

### U.S. Potash Deposits

THE American farmer's objection to protection for the American potash industry because he wanted once more the "good old cheap German potash," has apparently not brought him the desired boon. According to the United States Commissioner in Berlin, Germany is selling potash to America at prices varying from \$108 to \$122, according to time of delivery, while Holland is charged only \$50. The attempts at an increased production of potash in the United States have not attained any striking results. In 1915 the value of the potash produced was \$342,000, in 1918 it rose to \$15,839,618, but since then it has declined and the value for the first three months of the present year was only \$2,738,195.

In these circumstances Mr. H. D. Ruhm makes an earnest and reasoned plea for a systematic search for natural deposits of soluble potash. He turns almost inevitably to the example of Germany. "Practically all the deposits of rock salt," he writes, "scattered through the earth's crust have come there as the result of spontaneous evaporation of ancient seas or lakes. It will be seen, therefore, that within the layer or bed of purest sodium salt not even a trace of potash will be found, whereas, in the impure or low-grade rock-salt beds or layers, we may look for lenticular deposits or inclusions of carnallite or kainite, as are found at Strassfurt. Rock salt has been mined from such underground layers or beds in the older portions of Europe for the greater part of a thousand years. Naturally so far as possible the mining was confined to the purest deposits of rock salt, but in the workings at the different levels of the mines there were frequently encountered lenticular masses of low-grade varicoloured, impure salt which, whenever possible, was not disturbed, and was discarded when necessarily mined to get it out of the way. This was known for many years in the rather intensive development of the Strassfurt salt mines by the term 'bittersalz' and 'abraum-salz,' and in the salt-mining district huge piles of this material accumulated. When Liebig developed the theory of potassium being one of the essential elements of plant food and at the same time discovered that these waste heaps contained considerable percentage of potassium, the potash business of Germany started with the treatment of these piles of 'abraum-salz' near Strassfurt for the recovery of the potash content. The systematic nature of German records enables us to understand easily how the operators of the Strassfurt mine could go back and locate the levels, cross cuts, and stopes where the 'abraum-salz' had been most in the way, and this formerly waste and detrimental deposit was eagerly mined for the potash value, coming more and more into demand as Germany's intensive cultivation of her soil proceeded more and more along lines of scientific fertilisation."

The general conclusion from previous experiments seems to have been that "only salt deposits of the same geological age as the Strassfurt deposits can contain potash, notwithstanding the very plain evidence from Usiglio's observations that given right conditions, the desiccation of any sea will give similar deposits, and they are likely to exist in any salt beds of considerable thickness. In comparison with the painstaking and expensive prospecting which was necessary to locate

the German deposits even after actual knowledge of their existence had been given by the old workings in salt mines, it is perfectly justifiable to say that the United States has not so far even looked for potash where it would be of real benefit, *i.e.*, in the New York, Ohio, and Michigan salt fields. It is plainly evident that instead of spending enormous sums to investigate far western deposits the Government should spend at least an equal amount in core drilling in the East."

"It is," he says, "a Government task to develop this matter regardless of the fact that any work done will be on private instead of Government land. I say this for the reason that whenever the presence of potash deposits in the salt fields is definitely proved, the price of potash will drop on account of the fierce competition which will immediately spring up, until there will be no more profit in producing potash than in producing common salt. The benefit that will accrue to the farmer of the United States, however, will be incalculable. When the potash deposits which are surely there are developed, \$5 or \$10 per ton for 80 per cent. muriate of potash will be a high price, and no greater benefit can accrue to the farmer than this. If the Geological Survey and the Agricultural Department will make the search they will earn the everlasting gratitude of the farmer, and release the stranglehold which European potash has on this country."

### An Expert Licensing Committee

It seems pretty certain that one of the most contentious and difficult points in the Government's new Imports Restriction Bill will be the constitution and powers of the licensing authority, which must, of course, be an essential part of the machinery for ensuring that the influx of foreign dyestuffs does not exceed the actual needs of the British market. There is not unnaturally some uneasiness on this point, for the entire success of the restriction system may depend on the manner in which this authority exercises its powers. It is desirable at the outset to keep it absolutely above suspicion, for once it becomes suspected of approaching questions from any but a strictly central point of view, friction and distrust must inevitably grow. What the central principle is by which it ought to be guided we shall be able to judge better when the text of the measure is made public, but it may be taken at once that it would have to dispense equal justice to the three interests involved—makers, distributors and users.

Mr. Lennox Lee, as we pointed out last week, suggests a committee of "practical men with technical knowledge" appointed by the colour-consuming trades, or at least approved as to *personnel* by those trades. Another suggestion is that the principal interests concerned should nominate their representatives, in which case they would be in the position of watch-dogs present to protect particular interests rather than to make a success of the system as a whole. Even in such a case, matters often work out quite well, for English public men usually bring a fair and judicial spirit to such tasks. But the system has its risks. Yet another suggestion is that the committee should consist of members completely independent of either side and capable of an impartial judgment between the various parties. Such

a body could no doubt be found, and if the rules for its guidance were quite clear and were generally accepted, it might work as well as most judicial committees do in this country. It might tend to strengthen the public confidence in the licensing authority if its decisions were subject to revision. The principle of appeal runs all through our judicial system, and it implies no disrespect for the authority appealed against. But if such a right were granted it would have to be surrounded with safeguards against frivolous and capricious exercises of the right because if appeals became at all frequent or numerous the work of the committee might be seriously held up. The appeal might be either to the Board of Trade itself or, preferably, to an independent official set apart, as distinguished counsel often are, to decide between the judgment of experts representing conflicting interests.

There is one point about which some feeling may arise unless care is taken to guard against it. No member of any licensing authority should be in such a position as would expose him to the suspicion of benefiting commercially from knowledge gained in the course of official duties. For this reason the plan of having the committee limited to persons having no connection with trade interests has much to commend it, and it might be possible to comply with this rule without the sacrifice of the necessary technical and commercial knowledge.

### Raw Rubber Troubles

THE raw rubber market appears to be afflicted with some mysterious malady for which no one can reasonably account. The price of the raw material has been gradually declining of late until just recently it created a record. The industry is certainly sound at heart, and one wonders whether purchasers are sufficiently hopeful to assume that synthetic sources are really going to create a rivalry in the near future. Certainly, the colloiddally-minded throw out vague hints of wonderful developments, while we recollect being shown recently a remarkably life-like imitation which, it is said, will be turned out wholesale as a by-product by an enterprising undertaking which is hoping to establish a big oil industry in this country. It would appear, however, that Mincing Lane does not as yet take very much notice of the technical chemist, and the most reasonable construction to put upon the present situation is that the American buyer has for the moment ceased operations, with the result that producers have perforce to sell at any price in order to meet operating charges. Raw rubber cannot be indefinitely held up, for it is very liable to deterioration. Thus, we are witnessing at present the inevitable result of the supply being greater than the demand. The present price is about 1s. 7½d. per lb., and the prospects point to an unabsorbed surplus of 34,000 tons at the end of the year. The situation, however, is well controlled by the Rubber Growers' Association which, in order to curtail over-production have persuaded the various plantations to tap on alternate days only, but it would seem that even this drastic method has not yet had its effect. The Stock Exchange, however, can find a cheerful complexion for all such troubles, and here there is unanimous expectation that one of these days there

will be a quick change in the situation, and that directly the market turns prices will fly upwards. It is, perhaps, morally undermining for those in the chemical industry to put their nest-eggs into rubber, for while as consumers they must rejoice at present opportunities, it must be particularly galling for them to feel that by purchasing at existing prices they are assisting in the disintegration of their own capital.

### Getting to Work

WHILE business in this country is held up by trade disputes, and the workman seems less and less disposed to recognise the urgent necessity of the fullest production possible, the reports as to the conditions on the Continent are nearly all in the opposite direction. We hear from British chemical merchants who have recently been abroad that Germany is facing its heavy tasks with the stolid idea of making the best of a bad case. In France the position is reported to be similar. The country has suffered terribly during the war, but recovery is proceeding well. The most cheerful accounts however, come from Belgium. There the working classes are turning to their duties with real zeal and are putting in hard work and long hours with the idea of pulling the industries of their country round as quickly as possible. In some cases we hear of men declining to forsake work even on festival days and Sundays. The effect of all this is seen in the remarkable rate at which the shattered Belgian industries are recovering, in the steady improvement of the condition of the working classes, and in the general standard of contentment. One could wish that the responsible leaders of labour in this country paid a little more attention to such an example, and made it clear to those whose actions they so largely direct that the remedy for high prices and most of the other troubles we suffer from is steady and united work.

### The Calendar

Oct.		
2	Institution of British Foundrymen: Presidential Address by W. H. Meadowcroft. 4 p.m.	College of Technology, Manchester.
5	The Sheffield Association of Metallurgists and Metallurgical Chemists: "Steels Used in Railway Work," by Sir Henry Fowler. 7.30 p.m.	Assembly Room, Royal Victoria Hotel, Sheffield.
9	Mining Institute of Scotland: General Meeting.	Edinburgh.
12	Royal College of Science, Old Students' Association: "The Proposed University of Science and Technology: Can a Useful and Worthy University be Based on Pure and Applied Science?" by J.W. Williamson	Imperial College of Science and Technology, South Kensington.
18	Physical Society of London and Faraday Society (Joint Meeting): "The Physics and Chemistry of Colloids."	London.
18	Royal Automobile Club: "Alcohol Motor Fuel," by Professor H. B. Dixon. 9 p.m.	Great Gallery, Royal Automobile Club, Pall Mall, London.
19	Hull Chemical and Engineering Society: "The Chemistry of Foods" (Part II.), by A. R. Tankard. 7.30 p.m.	Victoria Room, The Metropole, West Street, Hull.



## The Individual Characteristics of Some Edible Oils

By A. A. Pollitt, M.Sc.

*The article deals in a concise manner with the preparation of the main edible oils. The common methods of adulteration are discussed, and tests are given which show how the presence and nature of the adulterants may be determined.*

### Linseed Oil

THE seeds of the flax plant, "*Linum usitatissimum*," which is intensively cultivated in Egypt, India, South America and Russia, provide the source of this oil. It consists of 85 to 90 per cent. of liquid fatty acid glycerides, which contain approximately 5 per cent. of oleic acid, 15 per cent. of linolic acid, 15 per cent. of linolenic acid, and 65 per cent. of isolinolenic acid. The remaining 10 to 15 per cent. of the oil is made up of the glycerides of solid fatty acids, chiefly palmitic.

Most of the oil is used in the manufacture of paints, varnishes, oilcloth, linoleum and soap. In Russia and Poland it is valued as an edible oil, and when intended for use as such, it is extracted by cold-expression, as the hot-drawn oil has a sharp and unpleasant taste. About 38,000 tons of the oil were imported by Britain in 1910 to the value of £1,250,000 sterling.

Hehner and Mitchell\* found that linseed oil gave as much as 24 per cent. of an insoluble bromide, melting at 143°C. to 144°C., and containing 56.3 per cent. of bromine. It is presumed to be the bromide of a mixed glyceride, oleodilinolenin. A test of the purity of the oil is based on the amount of this bromide produced by the insoluble bromide test. The boiled linseed oils give a lower proportion of insoluble bromide, and their fatty acids yield less hexabromide. The test is readily performed in the following manner: A weighed quantity of oil (about 1 gram.) is dissolved in a mixture of 40 ccs. of ether and 5 ccs. of glacial acetic acid. An excess of bromine is added, and, after six hours standing, the precipitate is collected on a tared filter paper, and dried in the water oven.†

Perhaps, the most important and characteristic property of linseed oil is its drying quality. On exposure to air, in a thin film, it becomes converted into a solid compound, known as "linoxyn," the result of oxidation and polymerisation. This rapid drying quality is assumed to be due to the high proportion of linolenic and isolinolenic acids present in the oil. The iodine value affords some justification for this assumption, being usually about 190 to 200. Also the iodine value is reduced by the process of "boiling," during which a certain amount of oxidation occurs.

Rosin, cotton-seed oil, rape oil, and fish oils are the more common adulterants of linseed oil, and may be detected by (1) the Liebermann-Storch reaction for rosin, (2) Halphen's test for cotton-seed oil, (3) the formation and separation of behenic acid from rape oil, and (4) by the blackening of the insoluble bromide, when heated, due to the presence of fish oils. Typical chemical and physical values for linseed oil, and also the other oils to be discussed, are given in tabular form at the end of this article.

### Cotton-seed Oil

The name of this oil indicates its origin. It is produced on an enormous scale from the seeds of the cotton plant "*Gossypium*," either by pressing or by solvent extraction. In 1910 about £600,000 worth of this oil was imported by this country, chiefly from America. The crude oil, as first obtained, is refined by treatment with alkali which neutralises the free fatty acids and precipitates most of the vegetable impurities. It is on account of this treatment that cotton-seed oil is nearly always neutral.

The oil consists of the glycerides of oleic, linolic and palmitic acids and a small proportion of stearic acid. On chilling it yields a deposit of "cotton stearine," which is composed mainly of palmitin and the glycerides of some liquid fatty acids. Oil from which "stearine" has been removed is known as "Winter Oil," since it does not readily solidify in cold weather.

Cotton-seed oil is one of the few vegetable oils which give a distinct colour reaction. When shaken with an equal volume of strong nitric acid and allowed to stand for 24 hours, it gives a brown colouration. This test will detect a very small proportion of cotton-seed oil in olive oil. Another colour reaction is given by the "silver nitrate test," devised by Bechi. The oil is heated with a mixture of the following solutions:—

1. 1 gram. of silver nitrate in 250 ccs. of 98 per cent. alcohol, 40 ccs. of ether and 2-3 drops of nitric acid.
2. 15 ccs. of colza oil in 100 ccs. of amyl alcohol.

Ten ccs. of the oil are shaken with 1 cc. of reagent (1), and then with 10 ccs. of reagent (2). It is then divided into two parts, one of which is heated for quarter of an hour in boiling water. A red-brown colouration in the heated portion indicates the presence of cotton-seed oil. It has been found preferable to apply this test to the free fatty acids, rather than to the oil itself.\*

Cotton-seed oil contains a constituent which gives an orange-red colouration when the oil is heated with an equal volume of a mixture of equal parts of amyl alcohol and carbon disulphide. The intensity of the colouration varies with the previous treatment and the variety of the oil, but the test is capable of detecting 5 per cent. or less of cotton-seed oil in admixture with other oils. Lard and other fats, such as butter, obtained from animals fed on cotton-seed cake, will give this test, which is known as Halphen's test.

In addition to these colour reactions, the presence of cotton-seed oil in olive oil may be detected by the iodine value of the liquid fatty acids and the melting point of the "stearine," which may be separated from the oil.

Cotton-seed oil is largely used as a salad oil, and is made up into compound lard and margarine, either after admixture with solid fats or after hydrogenation.

### Olive Oil

Many varieties of the olive ("*Olea europaea*") are cultivated in France, Spain and Italy, &c., and are treated to produce olive oil. The best quality is obtained by gently crushing (by hand) the freshly gathered fruit. Gentle mechanical pressing, which does not crush the stones, yields second quality oil, and third grade material is produced by heavily pressing the whole fruit, including the stones, in boiling water. The industrial oil is extracted from the residue by carbon disulphide. The freshness of the fruit and the method of extraction influence very considerably the flavour of the oil; in the lower grades, which are obtained by heavy expression in boiling water, other constituents of the fruit and stones are extracted and affect the flavour of the oil. If the fruit is damaged or is not fresh, free fatty acids are liberated by hydrolysis of the oil, and the latter will show a high acid value and will have an unpleasant, acid taste. The most expensive grades are produced in Tuscany and Provence, although Spain also supplies a good-quality oil. California, South Africa and Australia produce considerable quantities of the oil, but chiefly for local consumption.

Olive oil contains about 75 per cent. of liquid fatty acid glycerides (mainly oleic), and a small amount of linolic acid. The solid fatty acids consist mainly of palmitin. The presence of the solid glycerides is responsible for the oil becoming turbid in cold weather. The amount of free fatty acid ranges usually from 0.3 to 2 per cent. in the best oils, from 5 to 8 per cent. in the second and third grade oils, and may reach 25 per cent. in the industrial oils.

The common adulterants of olive oil are rape oil, cotton-seed oil, arachis oil and sesamé oil. Rape oil may be detected by separating the erucic acid, the characteristic unsaturated fatty acid of rape oil, by the lead-ether method and hydrogenating the ethereal solution in presence of palladium. The hydrogenated fatty acids are then fractionally crystallised from alcohol and the melting point of the last fraction determined. If behenic acid, produced by the hydrogenation of the erucic acid, is present, a melting point of 71-76°C. will be obtained. The details of this process appear in the *Analyst*, 1917, XLII., 86.

The presence of cotton-seed oil in olive oil may be detected by Halphen's test, sesamé oil by the Baudouin reaction, and arachis oil by the estimation of arachidic acid.

### Maize Oil

In the manufacture of maize starch, the germs of the plant (*Zea-mais*) constitute a by-product of the process, and contain

\* *Analyst*, 1898, XXIII., 317. † *J.S.C.I.*, 1911, XXX., 344.

\* *J.S.C.I.*, 1893, XII., 716.



about 50 per cent. of an oil of which it is possible to obtain approximately 75 per cent. by expression. The fresh oil has a golden-yellow colour and the characteristic smell of the original grain. It is an edible oil, and is used principally in the United States in the manufacture of oleomargarine and artificial lard, often in admixture with cotton-seed oil in order to disguise its odour in the finished foods.

It is composed chiefly of the glycerides of oleic, linolic and palmitic acids. About 7 per cent. of the fatty acids are solid, and there appears to be also an appreciable amount of volatile fatty acids. The oil contains a high proportion of unsaponifiable matter (1.5-2.0 per cent.), consisting of lecithin and phytosterol or sitosterol.

#### Almond Oil

Almond oil consists principally of olein together with a small amount of glycerides of solid fatty acids and about 6 per cent. of linolin. It is obtained from the kernels of bitter almonds, which yield about 40 per cent. of oil. The sweet variety of almonds are rarely expressed, although they yield the same amount of oil. The oils from both varieties are very similar, both in chemical and physical properties; they are not very liable to become rancid because of their small unsaturated fatty acid content.

Almond oil is frequently adulterated with peach-kernel and apricot-kernel oils. Both of these have a higher iodine value than almond oil, but analytical figures, in cases of mixtures, are not very reliable, nor are the suggested colour reactions infallible in such cases, although quite reliable for purposes of distinction between the individual oils.

#### Walnut Oil

About 65 per cent. of oil may be expressed from the kernels of the walnut tree (*Juglans regia*), and the cold-drawn oil is used as an edible oil in various European countries and, when fresh, has a pleasant taste. The hot-drawn oil is only suitable for industrial use, since it possesses an extremely acid taste.

The liquid fatty acids consist of oleic acid, 7 per cent.; linolic acid, 80 per cent.; linolenic and isolinolenic acids, 13 per cent. The solid fatty acids contain lauric and myristic acids. The oil yields from 1.5 to 2.0 per cent. of insoluble bromide, containing 58.6 per cent. of bromine, and is apparently the bromide of a mixed glyceride similar to that given by linseed oil.

The cold-drawn oil is of a pale yellow tint, it dries readily and is suited as a medium for white paints (artist's). The hot-drawn oil is much darker in colour. The common adulterants of this oil are linseed oil, sesame, arachis and rosin oils. The presence of linseed oil may be detected and its amount estimated (approximately) by the Hehner and Mitchell insoluble bromide test, the calculation being based on the usual proportion given by pure linseed oil (*i.e.*, 24 per cent.).

#### Poppy Oil

The seeds of the poppy (*Papaver somniferum*) yield 50 to 60 per cent. of oil. The plant is cultivated in Egypt, India and Persia, for the purpose of extracting the oil. The cold-expressed material is almost colourless and possesses a pleasing odour and taste. It is in common use as a salad oil and as an adulterant of olive oil; owing to its colourlessness it is also used in the preparation of artists' paints and is a good drying oil.

The hot-drawn oil is used as a medium for oil paints, since it also is of a very pale colour and is therefore especially suitable as a medium for the less delicate pigments.

The oil contains 8 per cent. of solid fatty acids and the liquid fatty acids consist usually of 30 per cent. oleic acid, 65 per cent. linolic acid, and 5 per cent. linolenic acid. The oil yields no insoluble bromides. The differentiation of poppy oil from walnut oil (in the examination of white paints, for example) is best effected by the hexabromide test; walnut oil yields 1.5 to 2 per cent. of hexabrominated glycerides, whilst poppy oil yields none.

#### Sesamé Oil

This oil is obtained from the seeds of "*Sesamum orientale*," which is cultivated in South Africa and the tropics. It is composed, in the main, of the glycerides of oleic and linolic acids together with smaller quantities of the glycerides of solid fatty acids, including palmitin, stearin and myristin. The unsaponifiable matter (1 to 1.5 per cent.) consists of phytosterol, sesamin and sesamol, which latter reacts with furfural and

hydrochloric acid. The oil is pale yellow and has a pleasant taste and odour.

The presence of the phenoloid substance "sesamol" has originated a colour reaction for this oil, which, when shaken with cold hydrochloric acid and cane sugar, gives a red colouration. This is known as the Baudouin test.\* It has been found that the colouration is due to the formation of furfural by the action of the acid on the sugar, and the use of an alcoholic solution of furfural, mixed with hydrochloric acid, is now recommended in place of Baudouin's original reagent.

As little as 1 per cent. of sesame oil may be detected by this test. Certain varieties of olive oil, however, are liable to give a similar reaction, and to eliminate this possible source of error the test should be applied to the mixed fatty acids from the oil.

Another test for sesame oil, known as Bishop's Reaction, consists in exposing the oil to light and air for some time, and shaking it with  $1\frac{1}{2}$  times its volume of hydrochloric acid. A green colouration is given to the acid layer due to the presence of oxidation products of the glycerin. The test may be applied to detect rancidity in other fats; old lard or butter, which do not give any colouration in the test, colour the acid green when mixed with fresh sesame oil.

As might be deduced from its iodine value, sesame oil is a semi-drying oil and is typical of this class of oils. Cotton-seed oil is commonly used to adulterate sesame oil and may be detected by Halphen's test. In certain countries, notably Germany and Austria, it is prohibited to sell margarine which does not contain a certain proportion of sesame oil.

#### Arachis Oil

This oil is obtained from the seeds of the "*Arachis hypogæa*." It is known also as earth-nut or pea-nut oil and the best quality is obtained by cold-expression whereby about 38 per cent. of oil is produced. Hot-expression of the residue yields another 10 per cent. of oil, and this together with any subsequent pressings is used in the preparation of soaps and lubricants.

The cold-drawn oil finds use as a salad oil and as a cheaper substitute for olive oil; it has a pale yellow colour and the flavour of the fresh nuts.

Arachis oil solidifies at a higher temperature (3 to 10°C.) than olive oil and contains olein, linolin, palmitin, stearin, arachidin, and lignocerin, plus about 6 per cent. of unsaturated fatty acids. It is often used to adulterate olive oil, and is best detected by the quantitative estimation of the mixed arachidic and lignoceric acids, which constitute about 4.8 per cent. of the total fatty acids. Biazzo and Vgdorcik† suggest the following procedure for rapidly detecting arachis oil in olive oil: The solid fatty acids, separated by the lead-ether method, are dissolved in 50 ccs. of 90 per cent. alcohol, to which has been added 10 drops of normal hydrochloric acid per litre. The flask is submerged in water at 15°C. for half an hour and the crystals which separate are dissolved in 25 ccs. of alcohol, which is also cooled. If the crystals still separate, they are dissolved in 12.5 ccs. of alcohol and the solution cooled; any further crystals which are deposited are dissolved in 5 ccs. of alcohol, which is then allowed to stand at the ordinary temperature. In this way an oil containing 5 per cent. of arachis oil will yield a sufficient amount of crystals for the determination of the melting point, which will be 73-74°C.

#### Candle-nut Oil

The "*Aleurites moluccana*," from which candle-nut oil is obtained, grows in Fiji and other South Sea Islands. The oil may be either cold or hot-drawn; in the first case it is a pale yellow, pleasant smelling and tasting oil and is used for food preparations. The hot-drawn oil is used as a paint vehicle and to adulterate linseed oil, though it is a slower drier than this oil. Such adulteration may be detected by the insoluble bromide test, since candle-nut oil yields a considerable deposit with bromine (7.3 to 8.5 per cent.).

#### Sunflower Oil

The sunflower is cultivated on a very large scale in China, India and Italy. The seeds contain 20 to 23 per cent. of an oil which is considered equal to olive oil for edible purposes. It is obtained by steam-heating and crushing the seeds, and is a pale yellow oil much used as a salad oil and for cooking purposes. It is a slow drier, but, in time, yields a hard film. It contains the glycerides of oleic, linolic and palmitic acids, and a small amount of linolenic acid.

\* J.S.C.I., 1894, XIII., 69.

† Analyst, 1917, XIII., 85.

**Castor Oil**

The most important sources of castor oil are East India, Java, Mexico and U.S.A. The seeds of the plant contain 45 to 55 per cent. of oil, which is produced on a large scale by expression or by solvent extraction. The medicinal oil is prepared from seeds which have been husked; the second and third pressings yield the industrial oil which is used in the manufacture of Turkey-Red oil, soap and lubricants. The press-cake is unfit for feeding purposes since it contains the alkaloid "ricine," originally present in the husks of the seeds.

The crude oil is refined by steaming, whereby albuminous matter is coagulated and may then be removed by filtration.

Castor oil is a colourless or pale green oil and differs from other fatty oils by reason of its high specific gravity (0.960). It does not dry. It is dextro-rotary, due to the presence of ricinoleic acid, the glyceride of which, triricinolein is the chief constituent of the oil. Palmitic and oleic acids are also present, and a small quantity of the glycerides of a natural dihydroxystearic acid. The oil is characterised by its high acetyl value, due to the presence of triricinolein.

**Typical Values of Various Edible Oils**

Oil.	Specific gravity at 15°C.	Saponification value.	Hegner value.	Reichert-Meißl value.	Iodine value.	Acetyl value.	Refractive index.	FATTY ACIDS.			
								Melting point. °C.	Solidification point. °C.	Iodine value of liquid fatty acids.	Mean molecular weight.
Linseed Oil.....	0.932-0.938	188-193	95	...	185-195	...	1.466	21-24	19-20	...	307
Cotton-Seed Oil	0.923-0.927	191-195	...	...	108-116	21.1	At 60°C. 1.457	35-40	35-32	137-149	...
Olive Oil.....	0.916-0.919	185-196	94-96	...	79-93	...	...	24-30	21-23	...	279.4
Maize Oil.....	0.921-0.922	189-193	93-95	4.2	...	...	At 15.5°C. 1.477	18-20	19	143	...
Almond Oil.....	{ 0.9175- 0.9195 }	189.5-192	96.2	...	93-101	...	1.4730	13-14	9.5-12.0	101.5	...
Walnut Oil.....	0.925-0.927	192-197	94-95.8	...	142-146	...	1.470	15-20	14-16	167	...
Poppy Oil.....	0.924-0.926	193-195	95.5	...	131-141	...	...	20.5	17-19	151.7	...
Sesamé Oil .....	0.921-0.924	188-193	...	1.2	103-108	...	At 20°C. 1.457	24-26	20-22	...	...
Arachis Oil.....	0.917-0.925	185-196	95.5	0.48	92-101	...	...	28.3	25-22	...	282
Candle-Nut Oil.	0.925-0.927	189-195	...	...	136-139	9.8	...	18.5	15.5	144	...
Sunflower Oil...	0.924-0.926	189-193	...	...	129-132	...	...	22-24	19.8	154.5	...
Castor Oil .....	0.963	176-183	...	1.1	83-86	147	At 15°C. 1.480	13	3	...	...

**Reviews**

MODERN EXPLOSIVES. By S. I. Levy, B.A., B.Sc., F.I.C. Sir Isaac Pitman & Son, Ltd., London. pp. 109. 3s. net

A few years ago it would perhaps have been a bold experiment to include a booklet on explosives in the "Common Commodities of Commerce and Industries" series, but the present volume is not only justified by the general interest which the great war aroused in this industry, but more particularly by the very able and readable manner in which the subject is presented.

Books on explosives have been few and far between; those fully qualified to write them have usually been doomed to silence in the interests of manufacturers, and even during the last few years it was usually the tyro who rushed into print rather than the expert of many years standing.

Mr. Levy has given us a concise and attractively written account of explosives manufacture during the war, suitable for consumption not only by the layman for whom it is primarily intended, but one which can be studied with pleasure and profit by those experienced in the explosives industry. His concluding chapter, entitled "Chemistry and National Welfare," is worthy of the attention of all manufacturers.

In a popularly written book slight technical errors are often frequent if pardonable, but your reviewer could find only two lapses in the present case. On p. 43 the plateaux of the Kessler sulphuric acid concentrator are stated to be of lead, while on pp. 26 and 36 it was amusing to find the old text-book fable that sulphur trioxide gas unites eagerly with water. Theoretically it should do so, but actually *strong* sulphuric acid is the most satisfactory medium, and is used in the "Absorbers" of contact plant.

C. J. G.

THE CARBOHYDRATES AND ALCOHOL. By Samuel Rideal, D.Sc., F.I.C., and Associates. London: Baillière, Tindall & Cox. 1920. Pp. 219. 12s. 6d.

This book is one of a series which have been written to afford a general survey of certain industries which are more or less dependent upon the application of chemical principles. Dr. Samuel Rideal, the editor of the series, is himself the chief author of the present volume, and has dealt with his subjects with his accustomed skill. The manufacture of starch, sugars, alcoholic beverages, vinegar, acetic acid, acetone and glycerine

are the industries with which the book is chiefly concerned. Some of the subjects necessarily receive rather scanty treatment as the size of the book is kept within modest limits, but the important industries of cane sugar and beet sugar manufacture are discussed at considerable length. The book will be useful to students of industrial chemistry in training colleges, and will be of interest to those actually engaged in the industries mentioned. The greater part of the book is so written that it can be intelligently read by technical operatives altogether ignorant of chemical science.

Dr. Rideal shows clearly the urgent need for the application of modern methods of cultivation and manufacture to the sugar industry in British India.

The section on "Synthetic Alcohol" is interesting and suggestive, but it does not state whether alcohol can be produced by any of the new methods at a sufficiently low cost to enable it to be extensively used as motor spirit. No figures are given to indicate the cost of manufacture. H. F. H.

**Income Tax—Employees' Assessments**

To the Editor of THE CHEMICAL AGE

SIR,—Your readers will doubtless remember that, a short time since, I pointed out that certain persons could claim assessment on the average, which clearly is a great advantage when salaries have been increasing. I am afraid, however, that there is still a sad lack of understanding of the benefits which may be derived by those entitled to claim.

Where a person is employed under a limited company in a subordinate capacity (*i.e.*, not holding a distinctive office such as director or secretary, &c.) it is usual to grant a claim for assessment on the basis of the average of the three years preceding. Ex-Service men come within this concession under certain conditions.

It is vitally important that a claim to be assessed as stated for the year 1920-21 should be made, as, if the recommendations of the Royal Commission are carried into effect, the possibility of such a claim will not occur in future years. Many persons have doubtless made their returns on the disadvantageous basis of one year, but there is still time to rectify any such return; or the assessment which will be notified shortly could be appealed against.—Yours, &c.,

67-68, Cheapside,  
London, E.C. 2.

W. R. FAIRBROTHER.

# American Chemical Society's Annual Meeting of 1920

## Some Impressions by Dr. Hugh S. Taylor

*The following is a review of the September meeting at Chicago of The American Chemical Society as it appeared to the writer. Dr. Taylor has not dealt with the proceedings in detail, but with those features of the meeting which were conspicuous owing to the interest they aroused.*

RECONSTRUCTION was announced as the keynote of the undertaking by the organisers of the meeting of the American Chemical Society, held in Chicago, U.S.A., from September 7 to 11 last. In many directions the features of the programme emphasised this aspect of the Society's activities, and of these several are worthy of record for the English chemical public.

The President of the Society, Professor W. A. Noyes, of the University of Illinois, in his address, dealing primarily with the subject of chemical publications, dwelt on the necessity that, in the work of reorganisation, the scope of the Society's activities must be extended rather than restricted. Faced with a budget exceeding by a large sum the present income of the Society, the Council have decided to increase the dues from \$10 to \$15, rather than curtail in any way the programme which they have outlined for increased usefulness of the Society to American chemistry in particular, and to the science as a whole.

### Publication Policy

The policy of the Society, whereby every member is to receive the three journals of the Society, the *Journal*, *Chemical Abstracts*, and the *Journal of Industrial and Engineering Chemistry*, is to be maintained. The separatist policy whereby for a reduced fee, one or two could be taken, has been rejected, and the decision has been reached to continue the policy of the present whereby all the members alike share the expense of the undertaking as well as the benefits which thereby accrue.

Announcement was made that in further improvement of *Chemical Abstracts* there is to be added this year to the index a formula index of both organic and inorganic compounds, somewhat after the manner of the German formula index of organic compounds, but adapted and extended by Mr. Hill of the U.S. Patent Office. The undertaking organised by the Society, in agreement with Great Britain and France as to the publication of chemical compendia, of producing a series of technical and of scientific monographs is in process of fulfilment. Ten scientific monographs have been arranged for publication, of which one on Enzymes by Dr. K. G. Falk is now in the printing stage. Two industrial monographs are at present in preparation, the first of which will probably be on the subject of "Industrial Hydrogen," by Dr. H. S. Taylor.

### Professors as Consultants

Of the principal addresses delivered to the meeting several were devoted to problems which a reconstruction policy involves and one to a chemical invention which promises developments of fundamental importance in the progress of chemical and metallurgical industry. Dr. H. P. Talbot, of Massachusetts Institute of Technology, in addition to his plea for development of the co-operative spirit between college and industry by an extension of the technology plan of co-operative chemical engineering courses also made a special plea for an increased employment of the University professor in a consultative capacity in the industries. Experience in the war, he stated, had justified the expectation that this form of co-operation would be fruitful of advance. Dr. W. A. Patrick, of Johns Hopkins University, lectured on the subject of Industrial uses of silica gel. The potentialities of this new industrial absorbent are so great\* and the information respecting it so meagre as yet in England that it seems worth while to give an extended account of the whole problem as learned from the lecture and from the lecturer in person.

### Silica Gel

The developments of defensive gas warfare stimulated to an extraordinary degree the study of adsorption agents for toxic gases. The peculiar nature of the demands created by the necessity for use under field conditions in small containers led

to the employment of charcoal, the adsorbent properties of which, especially at low temperatures, had long been utilised in scientific work. Highly efficient forms of this adsorbent were produced from the most diverse raw materials. At the conclusion of hostilities the various nations were producing suitable material from coconut shells, from various kinds of wood, and also from anthracite and coke. Much was learned as to the treatment necessary to bring the raw material into a condition most suitable for the purpose in view.

It was natural that the development of a product with the properties requisite in a gas mask charcoal should lead to applications of the material along industrial lines where the problems awaiting solution were similar to those involved in the removal of a toxic vapour or readily condensible gas from the air breathed by the armies in the battle zone. The literature of the past years reveals some of these applications. Thus, in a patent granted to Saddy the adsorption of the more readily condensible gases in a coal gas mixture, and especially ethylene, was to be accomplished under controlled conditions by passage of the gas mixture over adsorbent charcoal, from which, after saturation, the adsorbed gas could be recovered by increase of temperature and exhaustion. A similar use was studied by Bury in the experiments conducted at the Skinning-grove Iron Works relative to the removal of ethylene from coke-oven gas for subsequent conversion to alcohol. In this case, however, the use of sulphuric acid as adsorption agent was finally chosen.

Of adsorption agents known prior to the war none other than charcoal had been used for purposes of adsorption on any fair scale. The experimental work of von Benmelen and Zsigmondy had shown that various gelatinous materials, such as silica prepared by drying precipitated hydrated silica, alumina and iron oxide, possessed high absorption capacity. Such materials had, however, only been prepared in small quantities and had been employed mainly in the scientific study of absorption phenomena. Many interesting conclusions had been obtained with these materials in reference to the theoretical aspects of the subject and the relationships existing between the methods of preparation, the resulting size of pores of the gel material and the adsorptive capacity were fairly well investigated.

### Absorptive Capacity

The possibility of ready control of adsorptive capacity of the absorbing material by a control of the preparational procedure more rigorous than was possible in the various processes of treatment of charcoal, led to investigations in the United States as to the feasibility of large scale production of gels. Dr. W. A. Patrick, of the Johns Hopkins University, a former student of Zsigmondy in Gottingen, and later of Donnan in University College, London, brought these investigations to a successful conclusion. Owing to the cheapness of the necessary raw materials the silica gel was chosen for study, and experimentation developed the conditions necessary for securing the production of a uniform product of an adsorption efficiency equal in every respect to that of a high grade charcoal. According to a recent patent specification (Brit. Pat. 136,543, 1919), a silica gel, suitable for adsorbing gases and capable of retaining its properties up to 700° C. is obtained by mixing equal volumes of an acid, such as hydrochloric acid and sodium silicate solution of such a strength that all of the silica is liberated, the mixture being efficiently stirred so that immediate separation of the silica is prevented. The temperatures of the solutions may be varied between 35° and 80° C., but a temperature of 45-55° C. is preferred. The material is allowed to set to a gel and is then broken up, washed and slowly dried. The washing must be of the most rigorous kind for successful gels, and the sodium chloride content of the solution reduced to infinitesimally small

\* See the *CHEMICAL AGE*, Sept. 25, 1920 ("Editorial Notes").



proportions. The drying is effected in a current of air at 75-120° C., followed by an increase of temperature to 300-400° C. or by drying at the lower range of temperature in a vacuum. The product thus obtained is a hard glass-like material containing not more than 5 per cent. of water. The extent of drying governs the properties of the product and the best preparations are obtained if the drying is moisture free. At the conclusion of hostilities the condition governing the preparation had been so far worked out that material on the large scale was being produced technically for use in the gas mask canisters as a substitute for charcoal.

Developments since the armistice have indicated a wide applicability for such an adsorption agent. Experience gained in scientific investigations has shown that the amount of gas adsorbed by charcoal is largely determined by the previous history of the material. Thus, the adsorptive capacity of charcoal is enormously increased if, prior to use, the adsorbent is heated to a bright red heat in a vacuum. This results in the removal of gases adsorbed from the gaseous medium in which the charcoal was previously contained. It is now known that a large part of the gas removed by the "out-gassing" is due to oxygen, which charcoal not only has the property of absorbing but also of "fixing." The fixed oxygen is not removable as such by evacuation but leaves the charcoal as either carbon monoxide or carbon dioxide. This behaviour of carbon towards oxygen is familiar to the student of coal combustion. Thus, Rhead and Wheeler postulate, as the first stage in the process of combustion, the formation of a physico-chemical complex  $C_xO_y$ , which subsequently breaks down into carbon monoxide and carbon dioxide. Now, the presence of fixed oxygen on charcoal is detrimental to the material as an adsorption agent. Silica gel being relatively inert chemically does not show this phenomenon towards oxygen. Furthermore, in several cases, and notably so in the interaction of oxygen and hydrocarbons, porous carbon functions as a catalytic agent, so that, in the adsorption of such vapours from air by charcoal, the possibility of chemical action with development of heat, local rises of temperature and risk of explosion, when large masses of material are involved, is always present. Silica gel, on the other hand, is practically totally inert catalytically, a point of very great importance in the problem just referred to and also a matter of very great interest theoretically in the discussion of the relation of catalytic activity to adsorptive capacity. The purely adsorptive function of the silica gel is thus a very important item in its industrial application.

#### Industrial Applications of Silica Gel

Among the many industrial uses, development of which is being undertaken, two are related to the iron and steel industry. The iron oxide residues from the burning of pyrites ores still contain small quantities of sulphur, which are harmful in the blast furnace operations. To remove this sulphur it is necessary to calcine the ore at much higher temperatures, during which process the sulphur is oxidised to sulphur dioxide. Hitherto, this sulphur has been lost owing to its high dilution in the air employed for its oxidation. By passage of the cooled air-sulphur dioxide mixture through a tower containing silica gel it has been found that the sulphur dioxide may be practically quantitatively adsorbed. The gas thus adsorbed may be removed from the adsorbent by raising the temperature of the mass and blowing air slowly through the system, and it is obtained in concentrations suitable for further utilisation.

An application of considerable potentialities is now in process of development, the utilisation of the gel for the desiccation of the blast in iron smelting. As is well known, the Gayley process of utilising dry air blast makes use of refrigeration to lower the moisture content of the blast to the requisite degree. Silica gel has a very high adsorbing power for water. Indeed, experiment has shown that the concentration of water vapour in the air which is in equilibrium with silica gel is considerably lower than that in the air over calcium chloride, so that it is possible to "dehydrate" this latter by means of air which has been passed over silica gel. An experimental unit containing some 400 lbs. of gel has been investigated in U.S.A. and the success attending the experiment has been sufficiently great to justify an attempt to dry the air for a blast furnace consuming some 40,000 cubic feet of air per minute. It is calculated that a unit after saturation with

water vapour can be desaturated by heating with steam in coils situated within the adsorption mass. These coils after desaturation of the adsorbent and during the adsorption process can be cooled by running water, since the heat of adsorption which is of the same order of magnitude of that of condensation of the vapour tends to raise the temperature of the adsorbing medium. In this manner the time consumed in desaturation of spent gel should not occupy more than three hours. Thus, with one or more spare units, according to size, a continuous drying of the blast may be secured. An alternative process using powdered gel in conjunction with a bag filter system is also under trial.

#### Prevention of Waste

The problem of suitable adsorption agents for vapours is of especial importance in the organic chemical industry in the matter of solvent recovery. By judicious use of such it should be possible to reduce considerably the losses of solvent which are incidental to such processes. It would be interesting to know how much of the acetone produced for the manufacture of explosives during the war could have been recovered had suitable methods of adsorption in the various purification processes been practised. In this direction there are large opportunities for study of economy. What is true of solvent recovery is also true of vapour adsorption from gas mixtures such as coal and coke-oven gas. In the United States it is planned to adapt solid adsorbents to the removal of the petrol constituents of natural gas and to the vapours resulting from the cracking of heavy oils to yield lower boiling fractions. The rising cost of petrol and the relative scarcity will render such applications imperative.

It is conceivable that the extension of the principle will lead also to the evaluation of material, which is now largely dissipated into the atmosphere by way of the factory chimney. The problem of adsorption for the recovery of sulphurous vapours from the flue gases in the glass industry seemed to offer a valuable field for investigative work. The loss of sulphur from the salt-cake used in the glass industry alone is phenomenal and but little considered in the present technique of glass making. The perfected industry, however, must take an account of this matter. Nor is the field of possible adsorbents limited to those considered in this article. The producer of aluminium is aware of the hygroscopic nature of the purified alumina used in the manufacture of the metal by the electrolytic process. This property is undoubtedly dependent on the adsorbent properties of the material for vapours generally. Colloidal iron hydroxide possesses similar properties and may be prepared in similar form to that obtained with silica. Mixed gels of silica and various metallic oxides are even now in the laboratory scale of development. From their investigation new possibilities and new applications will surely arise.

#### Cellulose and Fuel

In the sectional meetings of the Society chief interest centred around the Divisions of Industrial and Engineering chemistry and the Division of Dye Chemistry. In the former a symposium on Cellulose and one on Fuel brought out large attendances and considerable interest. For the English scientific public a resumé of the fuel symposium should be full of interest. Low temperature carbonisation of coal was the subject of a contribution by Professor S. W. Parr, of the University of Illinois. According to his investigations, coals, which have hitherto been regarded as non-coking, and which are generally characterised by high oxygen content, are susceptible of treatment which will yield a satisfactory coke. It is found that, by a preliminary preheating of an Illinois non-coking coal with removal of steam and carbon dioxide, the subsequent increase of temperature to the coking stage causes exothermic reactions of the coal residue itself so far to predominate that a satisfactory coke product results. This coke is of the low-temperature variety, but is hard and also free-burning with a volatile content of 5-10 per cent. The factor of exothermicity in the coking process is of importance. The claim that it is enhanced sufficiently by the preliminary preheating deserves further study in reference to English coals along the lines of the investigations performed by Professor Cobb, of Leeds, whose results, however, would seem to discourage optimism in such direction. The Illinois experiments have thus far been conducted on 35 lb. samples of coal.

### Low Temperature Carbonisation

A communication by H. A. Curtis to the symposium on the commercial realisation of low temperature carbonisation had reference to the operations of a plant which is progressing rapidly towards the carbonisation of 500 tons of coal per day at Clinchfield, Virginia. The product, known as Carbocoal, is in reality produced by a combined low temperature-high temperature carbonisation process. The low temperature operation is carried out in horizontal carborundum-lined retorts, at a temperature of 900° Fahrenheit, the coal being continuously stirred and moved forward by means of paddles mounted on two heavy shafts running lengthwise through the retorts. The capacity is one ton of coal per hour per each retort, seven feet in diameter, 20 feet long.

The coke obtained is soft and friable. It is therefore ground, briquetted with pitch and carbonised for six hours at 1,800° F., the process yielding a hard dense coke. It is difficult to see what economic advantages are gained by the process, which is somewhat involved, since the gain in light oils is offset by a much lower gas yield per ton of coal, the use of all the pitch produced in the process and the general expense of the process.

The now familiar aspects of fuel economy in the coke oven industry were emphasised by F. W. Speer and by H. C. Porter. The substitution of coke oven gas for natural gas in regions where the sources of supply of the latter are failing is a recognised development of the immediate future for the steel and foundry coke regions. The use of producer gas for the coking process will therefore steadily increase.

### Petrol Economy

A contribution of fundamental importance in the question of economy of petrol was made by Dr. A. C. Fieldner and his associates of the Pittsburgh Station of the U.S. Bureau of Mines. In connection with an investigation of the ventilation required for a proposed tunnel under the Hudson River at New York for vehicular traffic, study has been made of the exhaust gases of automobile and motor truck engines. The amount and composition of the gases from motor vehicles was determined when operated on roads having gradients similar to those proposed for the tunnel, and when running at various speeds and under a variety of loads.

The tests conducted differed fundamentally from many tests which have been hitherto conducted in that no change in the carburetor adjustment was made from that upon which the vehicle was running immediately before the test in its normal usage. In this way it was hoped to obtain information based on actual operating conditions and not under the ideal conditions of adjustment under which the usual tests are made.

The results were a surprising divergence from those usually quoted. It was shown that the average automobile driver and truck operator is wasting 20 to 30 per cent. of his petrol by using too rich a mixture. The average carbon monoxide content of the exhaust gases from 70 representative cars and trucks was 6 to 8 per cent. Rich mixtures of petrol were more common than lean, a natural tendency in view of the greater smoothness of running and ease of acceleration of the motor with such mixtures. The results show that with a little intelligent attention to the carburetor adjustment a 25-35 per cent. greater mileage could readily be obtained with the average car. The saving of petrol which this would represent, in view of the increased usage of motor vehicles, would be a very considerable fuel economy.

In the general industrial field the Society's secretary, Dr. Charles L. Parsons, paid a splendid tribute to the developments which had taken place in England with reference to the substitution of ammonia for nitre in the production of nitric oxides for the lead chamber process.

### Mechanism of Catalytic Action

In the Division of Physical and Inorganic Chemistry several papers were contributed which have a definite bearing on lines of research to which much attention has been given in England recently. Studies of the thermal and photochemical decomposition of gaseous nitrogen pentoxide have been made by Farington Daniels and Elmer Johnston. The results obtained have been used as further evidence in support of the radiation theory of chemical action. Contributions on the mechanism of catalytic action were made by H. S. Taylor and his associates. A nickel catalyst has been shown to absorb definite measurable quantities of carbon dioxide, hydrogen, carbon monoxide, and

ethylene in the temperature region, 150-250° C., in which catalytic hydrogenation of such compounds occurs. The amount of the gas absorbed increases in the order of the gases named above. A study of the equilibrium in the case of benzene hydrogenation to yield cyclohexane shows values for the equilibrium concentrations of the reacting gases which are not in accord with the usual stoichiometric equation for the reaction.

In view of the approaching era of increasing competition from foreign sources in the dye industry it is significant that a considerable portion of the meetings of the Dye Division was devoted to discussions of the qualifications of organic chemists and the education of the research chemist. It is not intended that the American dye industry shall suffer by reason of lack of skilled technical and scientific supervision.

## American Chemical Notes

### From a "Chemical Age" Correspondent

THE reconstruction meeting of the American Chemical Society took place in Chicago this last week (September 6-10). There has been a marked decrease in activity in the chemical trade in many directions during the last few months, due in general to the tight money situation and the restriction of credit. The automobile and rubber industries have been particularly hard hit and are only operating at present from one-third to one-half capacity. Furthermore, the closing down of the textile mills naturally brought about a large contraction in dye production. It is thus considered inevitable that under present conditions, new developments should be restricted to a minimum.

Of general interest is the merger of the General Chemical, Barrett, Semet Solvay and National Aniline Companies into one organisation, with a capital of some three hundred million dollars (\$300,000,000) which is now an accomplished fact. The combination should make the parent company a very powerful factor in the dye industry, as it will now be in a position to obtain not only its raw coal-tar materials but also acids, alkalis, and general chemical supplies from within the organisation.

It is rumoured that the big Government cyanamide plant at Muscle Shoals has been acquired by certain fertiliser interests who propose to use it for the manufacture of ammonium phosphate, the phosphoric acid ( $P_2O_5$ ) to be obtained by the distillation of phosphate rock with silica at a high temperature, thus avoiding the use of sulphuric acid.

There were two interesting symposia held during the meeting, one dealing with the fuel problem and the other with cellulose. In the former, it was brought out that the average automobile gasoline waste due to incomplete combustion, ran as high as 20 to 30 per cent., as determined by the Bureau of Mines' examination of the exhaust gases. Whether it is possible to eliminate this by a more perfect carburettor, is uncertain in view of the personal equation and the variation in the load factor. It developed that low-temperature carbonisation is now being carried out commercially on a large scale.

In the symposium on cellulose the necessity for a more intensive study of the scientific as well of the technical side was advocated and as a result of the discussion it was decided to form a separate section for the discussion of cellulose problems. The present shortage of paper pulp and liquid fuel were brought out and considered as factors demanding the urgent attention of scientists and technologists. Professor Hibbert, of Yale University, led a discussion on the constitution of the cellulose molecule and submitted his new formula, which apparently is capable of explaining the reactions in a satisfactory manner, especially those relating to the recent work of the English School of Chemists dealing with carbohydrate and cellulose chemistry.

In the dye division considerable discussion took place on the training and qualifications of the chemist, which apparently still stand much in need of improvement.

The Bureau of Chemistry has recently introduced an innovation by creating a sub-division in which researches of scientific importance originating in the Bureau are to be developed on a semi-industrial scale with the idea of enabling the industry the better to obtain a clearer idea as to their commercial possibilities.

H. H.

## Artificial Leather and Coated Fabrics

### A Review of the Development of the Industries and Manufacturing Processes

ARTIFICIAL leather is a loose term more generally applied to any composite material made up of a base such as cloth, felt or paper, upon which is spread a coating embossed in imitation of grain leather. A very satisfactory product was obtained by coating split leather with pyroxylin. This led to the substitution of fabric for the leather, and thus began a large and growing industry. Stevens first suggested the use of amyl acetate as a solvent for pyroxylin, creating the pyroxylin lacquer industry; in 1884 Wilson and Story first coated cloth with a pyroxylin-amyl acetate solution with which was combined castor oil, the forerunner of the formulae in use to-day in the manufacture of artificial leather. Subsequent improvement in the latter product has been dependent upon the development of more satisfactory and cheaper solvent formulae, mostly discovered by rule-of-thumb experiment, and also through the use of a better quality of nitrocellulose.

As the result of improved methods for the purification and the nitration of cellulose, a product is obtained which, when combined with a suitable solvent, produces a "dope" which can be readily applied to the base, and upon evaporation of the solvent becomes a tough, elastic and durable film.

#### The Base Material

Little if any change has been made in the base material; the ordinary weaves of cotton cloth have not been improved upon. Cotton cloths, such as sheetings, ducks, sateens, and the heavier mole-skins do not possess an equal stretch in all directions. The strength of the coated fabric on the bias of the weave is somewhat dependent upon the toughness of the film, and in the present state of the art toughness of the film is, unfortunately, gained at the expense of pliability. Even should an improved film be developed, the unequal stretch of the base fabric would remain; a more suitable base fabric would, therefore, considerably improve the quality of the product. For many uses the unequal stretch of the fabric is immaterial; for certain uses the base may be composed of paper, felt, or other substance.

For automobile tops the coating is more often composed of rubber, or rubber substitute, or of boiled linseed or other oil combined with pigments. These are not usually termed by the trade as an artificial leather; they constitute, however, a very large class of coated fabrics.

The factors that control the physical and the chemical characteristics of nitrated cellulose are sufficiently well understood, and it is possible to obtain a product which is fairly satisfactory. Nevertheless certain qualities of the pyroxylin are still largely dependent upon the source from which the cellulose is obtained; the fibres from the seeds and the hulls of cotton are considered the most satisfactory. It is possible to purify and to nitrate wood pulp or other cellulose substance, but it is difficult to obtain uniformity of product. At the present price of wood pulp, cotton linters and hull shavings it is a question whether any real economy would result from the substitution of wood pulp. Uniformity of product is essential. A fairly complete dehydration of the nitrocellulose is also essential, and it is therefore necessary that the nitrocellulose be insoluble in ethyl alcohol, as in the most satisfactory method of dehydration the water is displaced by alcohol.

#### Manufacture of Pyroxylin-Coated Fabrics

The manufacture of pyroxylin-coated fabrics is not a complicated process. The more important steps are: Solution of the nitrocellulose in a solvent; incorporating oil and pigment with this solution; spreading the mixture on the fabric or other base material; evaporation of the solvent; recovery of the solvent (this step is not essential); embossing the coated fabric.

Cotton cloth is generally used as a base. This must be free from imperfections of weave and must be made from uniform yarn, as loose or heavy threads will show in the finished product. Light-weight fabrics, such as sheetings, are usually sized; heavy-weight fabrics are teased, to raise the nap. The cloth is usually dyed in order to prevent any discoloration of the back becoming apparent should the coating come through the cloth. In the light-weight fabrics this is largely prevented by the sizing, the primary object of which is to stiffen and

weight the goods. Raising the nap on the heavier weaves assists in producing a firm anchorage of the coating to the cloth. For certain uses, such as wall coverings, paper may be used as a base; felt, or fabric made from other material than cotton, may be coated successfully.

#### Secret Solvent Formulae

Many solvents and combinations of solvents have been used; it is to the development of improved or less expensive solvent formulae that the expansion of the industry has been largely due. For this reason the manufacturers of artificial leather keep their formulae secret. Patent literature is replete with solvent and "dope" formulae, but it is quite certain from commercial considerations that but few solvents are being used. The manufacture of artificial leather is a highly competitive business; for this reason the solvents selected are restricted to those that can be obtained cheaply. Ethyl alcohol is relied upon in the dehydration of the nitrocellulose and is an incidental constituent of most solvent formulae, but other aliphatic alcohols could be used. On the other hand, alcohol is not an essential constituent. Amyl acetate is now largely replaced by the cheaper ethyl acetate; this is diluted with benzol or other hydrocarbon of the benzol series. Benzene or gasoline is a constituent of some formulae. The pyroxylin solution must be clear, free from dirt and undissolved nitrocellulose, and as near as possible of a standard viscosity. The solution will contain from 75 to 90 per cent. solvent. If such a solution were used to produce a heavy film, the finished product would be stiff. In order to obtain pliability an oil is mixed with the pyroxylin solution, and to this mixture may be added pigments ground in oil to produce a coloured coating.

#### Oils Used to Give Pliability

Various oils may be used to give pliability to the film. Castor oil was first used, and no satisfactory substitute has been found where a light-coloured coating is required. This oil has, however, an objectionable odour which is noticeable in the finished product. Other oil may be substituted for castor, such as blown linseed, rapeseed or cottonseed, or a mixture of these; and other non-drying or semi-drying oils have been used. Blown oils are dark in colour, and therefore cannot be used with the lighter coloured pigments. Another source of trouble is the likelihood of the commonly used oils becoming rancid if the finished product is stored for any considerable time. A cheap, non-drying oil that is light in colour and one that would not develop rancidity would fill a long-felt want in the industry. Standard pigments ground in oil are used to give colour to the coating. The less expensive pigments are chosen. Except for light-weight coatings over a non-dyed base material it is not necessary that the pigment possess great covering power.

#### The Coating

The coating on a piece of artificial leather is built up of a number of thin coats, all of which do not have the same composition. Upon light-weight fabrics as few as three coats may be applied, while to produce an imitation of heavy Spanish leather, such as is used for upholstery, twenty-five to thirty or even more coats may be necessary. The first two coats are depended upon to give anchorage; these are of special composition and usually contain less oil and pigment than the succeeding coats. The top coats give the finish to the product, and take all the wear. These are applied thinly, except on very light-weight goods; usually the top contains neither oil nor pigment. Exceptions would be the imitation Spanish Morocco leathers, to which are applied an elaborate hand finish; or, in cheaper grades, machine finish.

Individual coats are applied, drawing the base material under a knife-edge, the "dope" being run on to the material in front of the knife-edge as fast as it is used. This operation is performed by machines. By paying attention to such details as the design of the knife-edge, the tension applied to the base material and the viscosity of the pyroxylin solution, it is possible to control the weight of each coat. In the present state of the art the quality of the product is improved by increasing the number of coats for a given weight of coating. This adds to the cost of production. Here is a very promising



field for development. Considerable ingenuity and a large amount of capital have been expended in attempting to solve the problem, so far without marked success.

Between individual coats the solvent is evaporated from the film more or less completely. Often some solvent is retained in the finished piece to give additional pliability, and a high boiling point solvent may be added for this purpose. This is not, however, a satisfactory method of obtaining pliability; in the first place, it is more expensive than other methods that may be used; in the second place, such solvent ultimately evaporates from the coating and thus defeats the purpose for which it was added. If an attempt be made to recover the solvent, that added for this purpose is an unnecessary loss.

#### Recovery of Solvent a Subject for Development

It is still a moot question as to whether the solvent which must be evaporated from the coating should be recovered or not, the claim being made that a better quality product can be produced without solvent recovery. For theoretical reasons the reverse should be true. With a properly designed recovery apparatus it is possible to control drying conditions and in this way produce a more uniform film. If from 80 to 90 per cent. of the solvent can be recovered, there is no question that recovery is economical. With the probability of increasing prices for solvents, the manufacturer with efficient solvent recovery apparatus has a decided advantage, both as to costs and quality. The problem of putting the recovered solvent into suitable condition for re-use is not difficult. There is an opportunity for considerable development along these lines.

The coated material from which all or at least a large proportion of the solvent has been removed is embossed in plate or rotary presses to get an imitation of grain leather. The heavier grades are preferably embossed on plate presses, as these are likely to roll-cut, and deep embossing is to be avoided. Imitation Spanish and Morocco leathers are hand-finished to give the impression of age to the product. To obtain this appearance a light deposit of a pigment darker in colour than the coating is spread over the embossed piece of goods. This pigment is rubbed off the high spots into the valleys of the embossing by means of a pad soaked in a solvent that softens the film slightly, anchoring the pigment on to the coating.

#### Two Problems Awaiting Solution

Two problems of utmost importance in the artificial leather industry are awaiting satisfactory solution. The first is the production of a durable film with fewer number of coats and the second has to do with the recovery of solvents. These apply to pyroxylin-coated fabrics. As has been pointed out, the base fabrics in use are not as satisfactory as could be desired. It is quite probable that the market for coated materials can be further developed, with improvement in durability and reduction in costs.—*Chemical and Metallurgical Engineering.*

#### Failure of Metals Under Internal or Prolonged Stress

THE Faraday Society, the Institution of Mechanical Engineers, the Institute of Metals (and probably the Iron and Steel Institute), contemplate holding early in 1921 a joint general discussion on "The Failure of Metals under Internal or Prolonged Stress." While the various aspects of the subject have already been discussed some new matter will be placed at the disposal of the co-operating Societies later in the year, and it is considered that this will afford an opportunity for a more comprehensive consideration of the subject than has yet been given to it.

The problem to be discussed is the failure of metal articles as a result either of external stresses to which they have been exposed for any length of time, or of internal stresses arising from conditions of manufacture, such as cold work, unequal expansion or contraction during casting and subsequent operations, including rapid heating and cooling. It is intended that the subject of the discussion should include the phenomena known as "season cracking," "corrosion cracking," "fire cracking," and analogous forms of failure, and that iron and steel, as well as non-ferrous metals, should be dealt with.

The scope of the discussion would permit of contributions relating to the properties and behaviour of materials other than metals which might throw light on the phenomena covered by the title. Anyone wishing to contribute to the discussion is asked to communicate with the Secretary of the Joint Committee, Mr. F. S. Spiers, 10, Essex Street, London, W.C. 2.

#### Presentation to Mr. John Gray

A DINNER to Mr. John Gray, as Chairman-elect of Gossage & Sons, Ltd., and John Knight, Ltd., and to Mrs. Gray, was given by the Chairman and Directors of Lever Brothers at the Midland Adelphi Hotel, Liverpool, on Thursday, September 23.

From an account of the proceedings given in the October No. of *Progress*, Lord Leverhulme (Chairman), in proposing the toast of the evening gave expression to the mingled feelings of regret and congratulation entertained on such an occasion, and said the gain of Messrs. Gossage and Messrs. Knight would be Lever Brothers' loss. It was desirable that the chairman of these companies should be able to carry to them some of the more intimate knowledge of the organization Lever Brothers had been able to build up for a great many years past. On the severance of Mr. Gray's direct connection with Lever Brothers he (the chairman) would miss a link with the past with Mr. Winser, under whose chieftainship Mr. Gray came in 1898. Lever Brothers never had occasion to regret that the choice fell upon Mr. Gray as successor to so loyal and devoted a colleague as Mr. Winser. No one, since Mr. Winser retired in 1902, had been in closer personal touch with him than Mr. Gray in all the planning of new buildings and business extensions. He recalled Mr. Gray's indefatigable war activities, which had made him hosts of friends in addition to those who had already proved loyal and devoted colleagues. If he had suffered a temporary breakdown as the result of his arduous duties, that was almost inevitable, and all rejoiced that he had recovered. He would now open up a wider circle of friends and new fields of activity with the same happy results as had attended his activities in the past. He asked Mr. Gray's acceptance from his colleagues and himself of a silver rose bowl and candelabra, and Mrs. Gray's acceptance of a diamond brooch, as a small token of the gratitude felt towards them.

Mr. Gray, thanking the chairman and his colleagues for all their good wishes, and for the gifts, said the presentation would always serve to remind them, if any reminder were necessary, of their very happy times at Port Sunlight in association with the chairman and all his colleagues. He regarded it as a high honour to have been invited to accept nomination to the chairmanship of the two associated companies, Gossage & Sons, Limited, and John Knight Limited. He had been greatly encouraged by the kind welcome he had received from the various members of their Boards, and it would be their joint determination to make these two companies second to none of all the companies associated with Port Sunlight in efficient administration and good service to the public.

A toast in honour of the Companies of which Mr. Gray was Chairman-elect was proposed by Mr. J. L. Ferguson, and responded to by Mr. C. H. Hamilton (Gossage & Sons) and Mr. S. Barnett (John Knight Limited). Mr. G. H. Kingdon proposed a toast to Lever Brothers Limited. To this Mr. W. Hulme Lever replied, and the meeting was brought to a close by Mr. Gilbert Fox's toast to the Chairman, the latter's reply, and the singing of "Auld Lang Syne" and the National Anthem.

The rose bowl which was supplied by Elkington & Company has the following inscription engraved on it: "Presented by Lever Brothers Limited to their Vice-Chairman, John Gray, Esq., on his appointment as Chairman of William Gossage & Sons, Limited, and John Knight Limited, September 23rd, 1920."

A staff dinner in the works took place the following Thursday.

#### Colloidal Physics and Chemistry

THE forthcoming general discussion on "The Physics and Chemistry of Colloids and their Bearing on Industrial Questions," which is being arranged jointly by the Faraday Society and the Physical Society of London, has been fixed to take place on Monday, October 25, at the Institution of Mechanical Engineers, Storey's Gate, London, S.W. 1. The discussion will be presided over by Professor Sir W. H. Bragg, and it will be introduced by Professor Dr. The Svedberg of the University of Upsala, who will give a general survey of the subject and its various branches. Non-members of the above societies wishing to attend the discussion may obtain tickets of admission from Mr. F. S. Spiers, 10, Essex Street, London, W.C. 2.

## British Chemical Trade Association

### President's Review of the Year's Work

ADDRESSING the members of the British Chemical Trades Association at the second annual meeting on Wednesday, September 29, Mr. William Mann, the President, said that whereas a great deal of the time up to the date of the first annual meeting last year had been spent in establishing the organisation and in the registration of the Association, the period between then and the present time had been devoted to protecting and furthering the interests of the chemical trader. When the Government last year brought into force restrictions on the importation of chemicals, dyestuffs, &c., the Association took the matter up at once and made representations to the Board of Trade on behalf of its members and the trade generally. Interviews and deputations were arranged, and finally, when an Advisory Committee was formed to assist the Board of Trade in the issue of import and export licences, the British Chemical Trade Association was granted direct representation on that Committee as representing the merchanting interests of the chemical trade. He believed he was correct in saying that this was the first time in the history of the trade that the merchanting community had received Government recognition, and he thought they would all agree that this was a great achievement on the part of the Association. He himself was nominated to represent the Association on this Committee, and there was no doubt that, had it not been for the Association's representation at the meetings of the Committee, the restrictions would have been of even a more crippling nature than they were. On numerous occasions applications for licences which other represented interests desired to refuse were fought out, and in the end were granted. He had no hesitation in saying that the work performed by the Association in connection with this Committee and the Imports and Exports Licensing Section generally justified over and over again the existence of the Association. Later on, under a legal decision, it was found that the restrictions were illegal, and they were, therefore, withdrawn. It was for such occasions as these that the Association was formed, and it could be said that in this case it performed a very useful work on behalf of the chemical trader.

The restrictions on the importation of dyestuffs then in force were governed by a different body, and the Association, from the very beginning, carried out a strong campaign against the unfair method adopted by the Government in putting these restrictions into force.

### Export Restrictions

Coming to the time when there were only the export restrictions to contend with, these, he remarked, referred chiefly to dyestuffs, and they were all aware of the chief and most objectionable feature ruling in this matter, namely, the manufacturer's certificate. The Government laid down the rule that before they would even consider an application for a licence to export dyestuffs they must be furnished with a manufacturer's certificate to the effect that the goods were sold by the manufacturer to the applicant for the express purpose of export to a specified destination, and further, that such export would not be detrimental to home supplies. They all knew what had happened under this obviously unfair ruling. The merchant, unable to purchase direct from the manufacturer, was forced to buy in the open market, and because he did so he was refused his export licence. Under the cloak of Government protection the manufacturers were given the opportunity of filching from the merchant his legitimate business. But what had happened? The merchant, finding that he was debarred from exporting from this country, began to place his business in the American and other foreign markets. These restrictions on trade, for they were nothing else, were driving a considerable amount of trade out of the country. For months continued representations had been made to the Board of Trade, and it was only quite recently that the matter was finally settled and something approaching satisfaction obtained.

### Pending Legislation

They had recently been officially informed by the Board of Trade that it was the intention of the Government to introduce legislation at the earliest opportunity next session to restrict the importation of dyestuffs and certain chemicals. When that "earliest opportunity" would be he should not like to

hazard a guess. There was, no doubt, a division of opinion in the Government on this matter, and a doubt was expressed as to whether the Bill, if introduced, would successfully withstand the opposition it would inevitably meet. In the meantime traders were being kept in a state of suspense. Nevertheless, this pending legislation had already received the consideration of the Association, and they had been advised by the Board of Trade that, in the event of an Advisory Committee being set up to assist the department in the issue of licences, due consideration would be given to the importance of the merchanting interests. The members could rest assured that the Committee of the Association would continue to watch developments and keep them fully informed on the subject. He would like to say in this connection that in all their dealings with the officials of the Board of Trade, as with all the other departments, they had been received with every courtesy, and, although at times they had been compelled to disagree with their views, relations between the Association and the Board of Trade were of a very friendly character. Several of their members recently had occasion to request the Association to take up a general complaint with the Ministry of Agriculture regarding the exportation of sulphate of ammonia. This was immediately taken in hand, and, after consultation with the Ministry's officials, an undertaking was given that the matter of the complaint—unequal distribution—would be adjusted.

### The Profiteering Act

With regard to the Profiteering Act, the department administering this had recently been turning its attention to offers or sales of soda crystals, &c., on the open market, and several members of the Association had received notices from the department requesting them to furnish particulars of specified transactions. The department, however, had no power whatever to investigate export business, and members had been advised as to the best course to adopt. For some considerable time the Association had worked in close co-operation with the Department of Overseas Trade, and the assistance rendered had been very much appreciated by the members. There was no doubt that this department was carrying out, in an effective manner, work of practical assistance to the overseas trader.

The last Government Department to which he wished to refer was the Income Tax Department. The Association had been notified that its members were allowed to count their entrance fees and annual subscriptions to the Association as a business expense when making returns for Income Tax, and that was just one more proof of the Government's recognition of the Association as the representative body of the chemical trade.

### Chemical and Dyestuff Traders' Association

Discussing the position created by the formation of the Chemical and Dyestuffs Traders' Association, the President said that the British Chemical Traders' Association had never been desirous of there being two associations to protect the interests of the merchant because they knew that in the conflict that must inevitably arise between two organisations having the same objects and attempting to accomplish exactly the same thing without any co-operation, the members of both must suffer and the trade would be better without them. Having this in mind the Committee of the British Chemical Traders' Association approached the leading members of the other Association before it was formed and asked them, in the interests of the trade, to join the existing Association. Rightly or wrongly they decided not to come in, but the Board of Trade since then had made it quite plain to the members of both Associations that they should meet and discuss the position. A meeting had been held of three members of the Executives on either side and he believed, after a very frank discussion of the position, that they seemed to have found common ground, and he was confident that if the Committee of the Association was permitted to continue the negotiations it would be possible to effect a fusion of the two Associations. They could be quite certain that the Committee would not in any way sacrifice the interests of the Association. They were out for a fusion which was honourable and one which recognised the part which the British Chemical Trades' Association had played during what he regarded as the most testing time in the history of industry and commerce. Before any definite decisions were come to the matter would be referred to an extraordinary general meeting of the members.

## Alsation Potash

### A Survey of German-owned Deposits

A COMPREHENSIVE survey of the Alsation potash industry has been written by Mr. Ernest L. Ives, American consul, who finds that the majority of the capital invested in the mines of Alsace is German. When potash was discovered in Alsace in 1904 a company called the Good Hope was formed to work the mines, but its capital was quickly spent, and recourse was had to loans. These were not successful among French capitalists, with the exception of some of the banks at Nancy, and the company turned to German capitalists and met with successful results in Berlin.

It is due to these circumstances that of the 106 concessions obtained by the company, 76 were acquired by Germans. At the time of the armistice the upper Alsation mines belonged to four groups, three German and the other Franco-Alsation. The first group, the Deutsche Kaliwerke of Bernterode, one of the largest producers of the Stassfurt region, worked the mines of the south-west with a capital of \$7,720,000. This group owned seven concessions covering an area of 28,417 acres. There was also some French and Alsation capital invested in these concessions. The second group, that of the Wintershall, with a capital of \$2,412,000, in which the Alsation Government was interested, owned two concessions covering 5,683 acres. The third group, that of the Hohenzollern or Roehling, owned two concessions covering an area of 5,683 acres, with a capital of \$2,895,000. In this group the Alsation Government was also interested. The fourth group, the Franco-Alsation, owned several concessions covering an area of 14,826 acres and capitalized at \$4,432,500.

Except for the last group, the majority of capital invested was German. At the time of the signing of the armistice the amount of the capital invested was in the neighbourhood of \$17,370,000 and was divided as follows: German and Alsation Government capital, 55 per cent. or \$9,553,500; French capital, 25 per cent., or \$4,342,500; Alsation capital, 20 per cent., or \$3,474,000.

### Present Administration of the Mines

At the present time, with the exception of the Kali Ste-Thérèse French company, which is working the Bollwiller and Ensisheim mines, the Alsation potash mines are under the administration of a sequestration committee which resumed the exploitation and sales through the Bureau de Vente de Mulhouse now known as the Société Commerciale des Potasses d'Alsace.

The Alsation potash layer is found to contain sylvinites, which is a mixture of potassium chloride and sodium chloride. The analysis of the French Bureau of Mines shows the composition of the sylvinites extracted from the mines actually in operation to be as follows: Potassium chloride (corresponding to 19.80 per cent. potash) 31.30 per cent., sodium chloride 56.00 per cent., magnesium chloride 0.35 per cent., sulphate of lime 2.90 per cent., insoluble matter 8.55 per cent., humidity 0.90 per cent.

This analysis differs from the analysis of the German crude salts mined at Stassfurt before the war in the small amount of magnesium chloride, which is said to be detrimental to certain plants such as sugar beets, potatoes, and tobacco. Alsation potash has also the advantage of its smaller water-absorbing power, as it contains only 0.90 per cent. humidity, whereas the hartsalz contains 5 per cent., kainite 13 per cent., and carnallite 26 per cent. It is maintained that Alsation salts stand long-distance transportation and storage better than Stassfurt salts. The average percentage of sylvine, practically pure potassium chloride, varies between 25 to 40 per cent. in the Alsation salts, whereas it varies between 15 and 35 per cent. in the Stassfurt salts.

### Production

The first potash mined in Alsace was at Vittelheim in 1910. The 17 shafts sunk supply about 2,000 metric tons of sylvinites per day, or 600,000 metric tons per year, containing about 120,000 metric tons of potassium oxide.

The production of Alsation potash (crude salts), during the last seven years has been as follows:—

								Metric tons.
1913	...	...	...	...	...	...	...	355,341
1914	...	...	...	...	...	...	...	325,880
1915	...	...	...	...	...	...	...	114,358
1916	...	...	...	...	...	...	...	204,474
1917	...	...	...	...	...	...	...	320,131
1918	...	...	...	...	...	...	...	333,499
1919	...	...	...	...	...	...	...	592,000

Alsation potash intended for filling orders taken in America is shipped by rail in covered cars from Mulhouse, the centre of the Alsation mining operations, to Strassburg. The distance is somewhat over 100 miles and usually a one night's haul. At Strassburg the potash is loaded in barges and shipped by the Rhine either to Antwerp or Rotterdam, where it is transhipped to ocean steamers. The through rate from Mulhouse per rail and water to Antwerp and Rotterdam is 40 francs per metric ton (\$7.72 at the normal rate of \$0.193 to the franc). According to a French official statement, the German Kalisyn-dicat has approached the American agents of the French potash authorities with a view to obtaining a simultaneous advance of \$10, but the latter refused on the ground that sales must be made at the price fixed by the French.

### Consumption

The following table shows the amount of potash consumed in agriculture and industry respectively during a period of 18 years previous to 1914. The figures represent metric tons of pure potash.

Years.	Consumption, in metric tons.		
	In agri-culture.	In in-dustry.	Total.
1895	...	...	...
1900	...	...	...
1905	...	...	...
1910	...	...	...
1913	...	...	...

### State Purchase of Mines Proposed

A project for the future working of the mines has been presented by the Government and is at present under consideration by the Chambers. In fact, the first part of it has just passed the Chamber of Deputies. Last year, before the Chamber of Deputies, M. Millerand insisted upon the necessity of the State taking over the potash mines and renting them to groups for the purpose of exploitation. M. Loucheur was of the same opinion, and added that the Government intended to call for the participation of agricultural syndicates in the exploitation of the mines. M. Clémenceau confirmed the above, and stated that the exploitation of the mines should be entrusted to a large extent to Alsation groups.

In accordance with the above, the project of purchase by the State has been presented by the Government to the Chamber of Deputies, and was passed by the Chamber in its sitting of July 30, 1920. Further legislation will determine the conditions under which the concessions will be made. They have already been examined by the different commissions, and the projected regime is based upon the principles of the new mining law of September 9, 1919, authorizing concessions for a fixed period of time with State and labour participation in the profits.

The production of the Alsation mines was for a long time limited by the German Government under its law of May 25, 1910, requiring that every German potash mine should become a member of the Kalisyn-dicat and stipulating that all sales should be made through the selling office of the syndicate at Berlin, and, further, that the syndicate should determine the output of each mine based upon its age and producing capacity. By the terms of this law the development of the Alsation potash mines was controlled by the syndicate which allotted 5 per cent. of the sales to the Alsation mines.

The production of the Alsation mines was 355,341 tons of crude salts in 1913, was increased to 592,000 tons in 1919. Previous to the war, the world's consumption was about 1,500,000 metric tons, Germany consuming about half of this amount.

The production of Alsation potash (crude salts) for 1920 is estimated at 1,320,000 metric tons; for 1921 the estimate is 2,040,000 metric tons; and for 1922, it is placed at 2,340,000 metric tons. About 33 per cent. of production is utilised in France, and 66 per cent. is exported. In 1895 the industrial use of potash took up about 50 per cent. of the production. In 1913 the industrial use had decreased to about 10 per cent.



## Death of Mr. D. H. Nagel

### His Work for Chemistry at Oxford

MR. DAVID HENRY NAGEL, Vice-president and Senior Tutor of Trinity College, Oxford, who died on Monday at the age of 57 years, had a distinguished record as a chemist, though chemistry by no means absorbed all his interest and activity. Elected in 1882 to the Millard Scholarship at Trinity College, he took a first class in the Final Honours School of Chemistry in 1886. Mr. Nagel was appointed Lecturer in Chemistry and Physics at Trinity in 1888, and two years later was elected Fellow and science tutor of his college. In 1907 he succeeded the President both as Senior Tutor and Junior Bursar.

Mr. Nagel was assistant, first to Professor Harold B. Dixon, now at Manchester, and later to Sir John Conroy, but for close on 20 years he had the chief responsibility for the conduct of the laboratory which Trinity shared with Balliol. Intended originally as a college laboratory, its scope was extended in 1904, when the two colleges undertook to provide a practical course in physical chemistry for all undergraduates reading for the Chemistry School, thus making it virtually a University institution. In the planning and supervising of this course Nagel's intimate knowledge of the physical aspects of chemistry and his skill in handling and devising apparatus were invaluable.

According to a writer in *The Times*, obviously an intimate personal friend, Nagel was an admirable critic of laboratory work, had a quick eye to detect slovenliness or mistakes, but he was a most patient and kindly teacher and would take endless pains and care to see that his students understood what they were doing and why it should be done in a particular way. He did little original work, partly owing to the many duties that fell to his lot, but he had an amazing knowledge of chemical and physical literature and of experimental method which was always at the disposal of his colleagues, who rarely went to see him in vain for information.

The outstanding feature of Nagel's mind was his breadth of view on any question in which natural science was concerned. He had an almost universal acquaintance with the sciences and an unusually clear vision of their relation to one another. It was this which gave him a unique position on all University boards and committees in the Science Faculty. He was seen perhaps at his best as chairman of the Board of the Faculty of Natural Science. He was also the leading member of the Committee for Agriculture and Forestry, delegate of the University Museum, and a member of several other boards in the Science Faculty. He devoted himself unsparingly to the work of all these bodies, and by his efforts to secure their due co-ordination he rendered great service both to the University and to the cause of science. He was keenly interested in all these technical points of manufacture and finance which arise in the conduct of a great business, and of all such questions his judgment was admirable. The late Charles Cannan used to say that if he wanted to know anything about zinc, Nagel not only had the answer ready, but would produce a piece out of his pocket.

## Chemical Trade Inquiries

The following inquiries, abstracted from the "Board of Trade Journal," have been received at the Department of Overseas Trade (Development and Intelligence), 35, Old Queen Street, London, S.W.1. British firms may obtain the names and addresses of the inquirers by applying to the Department (quoting the reference number and country), except where otherwise stated.

LOCALITY OF FIRM OR AGENT.	MATERIALS.	REF. NO.
South Africa	Glassware. Replies to the South African Government Trade Commissioner, 90, Cannon Street, London, E.C. 4.	—
Larnaca (Cyprus)	Glassware ... ..	410
Czecho-Slovakia	Mineral colours; glassware ...	412
Argentine Republic.	Glassware ... ..	418
Rio de Janeiro	Light chemicals ... ..	—
Central America	Drugs; chemicals; glassware ...	—

## French Chemical Industry

A COMPANY termed La Société des Cristalleries de Nancy has been formed to manufacture perfume bottles, which were formerly imported. As the production of natural and synthetic perfumes is making great headway, the new company should find a ready market for its products. Prices in the perfumery market have reached such abnormal heights that former big buyers, like America, are holding back. The policy of high prices is deprecated by many as being certain to lead to the establishment of large perfume factories in foreign countries.

The French Chamber of Deputies has sanctioned the raising of a loan of 744,140,000 francs by the Moroccan Government for the purpose of exploiting the rich beds of phosphates discovered in the district of El Boroudj.

On July 31 the French Chamber of Deputies sanctioned the appropriation of 76 million francs for the purchase and management by the State of the potash mines in Alsace, and one million francs for preliminary working expenses. As a consequence, the official liquidator of the mines, who is chairman of the Société Commerciale des Potasses d'Alsace, has decided to reduce the amount of potash salts allocated for export during the last four months of this year, and to render available for French agriculture 22,000 tons of potash ( $K_2O$ ) in excess of the amount originally provided for.

The output of coal from the Sarre region is increasing every month, and the supply of American coal, which is coming in at the rate of 335,000 tons monthly, is expected soon to reach 500,000 tons. The French production has been 2,143,000 tons of coal and 159,000 tons of coke, which represents an increase of 50 per cent. over the average production from January to May. The supply of German coal for August reached the figure agreed to at the Spa Conference, viz., 1,640,000 tons. The actual deliveries totalled 1,646,186 tons, made up as follows (the figures in brackets represent the quantities agreed to): Ruhr district, 1,457,988 tons (1,458,000); Aix-la-Chapelle, 66,268 tons (64,000); Cologne basin, 121,430 tons (120,000.) J.S.C.I.

## British Trade with China

DURING the war British trade with China naturally fell off, and though it began to revive immediately after the Armistice, Japan and America in the meantime had enormously increased their trading connections with that country. America is probably our most serious competitor at the present time owing to the persistent boycott of Japanese goods established for political reasons in 1919. Over 100 American firms have opened in Shanghai alone during the past year.

In 1918, the latest year for which official figures are available, the imports of medicines into China amounted in value to 5,000,000 taels, or roughly £1,300,000. The bulk of this trade went to America and Japan; of the total sum only £58,000 represents Britain's share. It must, of course, be remembered that this was the worst year of the war from the point of view of British overseas trade.

In addition to medicines there is a good market in China for toilet preparations of all kinds, and for perfumes.

A very important point in connection with goods intended for the Chinese market is the "get-up" and style. It is necessary, of course, that names and directions should be printed in Chinese characters, and some attention must be paid to the colour of the cartons, wrappings and labels. The Chinese people do not like dead or neutral tints. All shades of red and pink are good, and yellow, the old Imperial colour, is also allowable. White and blue, in conjunction, are considered mourning colours, so perhaps it is not advisable to employ them more than necessary. Reverting to the actual preparations to be sold, it is worth remembering that strong-tasting medicines are considered efficacious, and that it is not essential to sweeten and flavour liquids to any great extent; while, for the same reason, pills and tablets need not be sugar-coated to disguise their taste, if unpalatable.

American, French, German, Swiss and British synthetic indigos are all imported. There is a great market for indigo in China, and if manufacturers can succeed in producing sufficient quantities of the dye for export they will find that a large business awaits them. The same may be said of aniline dyes. German firms are already regaining their ascendancy in the Chinese market.

### Manchester Chemical Trade

SIR S. W. ROYSE & CO., LTD., in their monthly report state: There has been a curtailment of business during September, the threatened strike of the miners and the position in the cotton trade having caused a tendency to postpone heavy commitments pending more settled conditions. The price of sulphate of copper is unchanged, but more business has been passing and there is a better enquiry for export, especially for forward shipment. Green copperas has been moving steadily for both home and export account. Acetates of lime are unchanged but acetic acid is firmer. Acetate of soda has been in moderate request and acetates of lead have been receiving more attention at the lower prices ruling. Nitrate of lead, however, is dull. Carbonate of potash has been in only slow demand, and the price is a little easier. Sulphate of potash is offering in only moderate quantities. The heavy demand from abroad for white powdered arsenic continues; supplies are short and firmly held. Yellow prussiate of potash has been moving steadily, and a good business has also been done in prussiate of soda chiefly for export; the demand continues, but manufacturers are not disposed to sell far ahead at present. Tartaric acid has been in good request for export, stocks have been reduced and good business has been done for next year's delivery. Cream of tartar has moved only slowly and price is somewhat easier. There has been some pressure to effect sales in citric acid, and lower prices have been accepted for quantities. The demand for bichromates of potash and soda has fallen away somewhat. Oxalic acid has been well enquired for, stocks of foreign have been reduced and English makers are holding firmly to their prices. Makers of borax and boracic acid are still well supplied with orders. There is a brisk enquiry for phosphate of soda and supplies are short in spite of some good arrivals from abroad. The demand has fallen off somewhat for muriate of ammonia and lump sal ammoniac, but prices are unchanged. Caustic soda is easier for export. Bleaching powder has been in better demand. The prices of ammonia alkali, bicarbonate of soda and soda crystals have been advanced for the home trade. With one or two exceptions the market for tar products remains practically unchanged, though little business is being done. Benzoles and toluoles are readily absorbed by present demands, prices remaining very firm. There is slightly more activity in solvent naphtha and prices if anything are better. Creosote is in good demand with an upward tendency in price. Pitch continues a firm market and some good business has been done over next season at current values. Crude carbolic acid is depressed with consequent lowering of price. Parcels of crystal carbolic shipped some time ago to the East are offering for re-shipment to this market. Liquid carbolic is also in better supply. Sulphate of ammonia remains unchanged.

### The Affairs of Phineas Keats

PHINEAS (OR PHILIP) KEATS (OR KATZ), 27, chemist, 167, Balsall Heath Road, Birmingham, was again brought before the Birmingham Deputy Stipendiary last week, when the charge of obtaining by false pretences from J. T. Davies, of Bristol Road, two cheques—one valued at £4,000 on July 21, and the other for £1,200 on August 3—was further investigated. The whole of the proceedings were devoted to the cross-examination by prisoner's counsel of Mr. Adolf Hirschfeld, one of the four witnesses who had given evidence at the previous hearing, and at the conclusion the case was again adjourned.

### Mistaken for Coalowners

AN amusing incident which occurred outside the Board of Trade on Saturday morning may be recorded. A deputation from the Chemical and Dyestuff Traders' Association, on coming out of the building after an interview with Mr. Percy Ashley, stood in a group chatting for a few minutes. They consisted of Mr. F. T. T. Reynolds (Manchester), Mr. A. F. Butler (London), Mr. H. Gilliat (Leeds), and the Officials of the Association. The Press photographers, on the look-out for notabilities, instantly mistook them for a deputation of coalowners, and approached them with a view to taking "snaps." It took some minutes to assure them they were mistaken, and when the situation was explained there was considerable amusement on both sides.

### Structural Constitution of High-speed Steel

PROFESSOR HONDA, whose researches on the alloys of iron with chromium and tungsten are well known, has recently published in the Science Reports of the Tohoku Imperial University an investigation on the structural constitution of high-speed steels containing these elements. He concludes that in an annealed steel containing 5 per cent. of chromium, 18 per cent. of tungsten, and 0.6 per cent. of carbon the alloy consists of a solution of iron tungstide in iron, together with free tungstide and the carbides  $\text{Cr}_3\text{C}_2$  and  $\text{WC}$ . On heating such a steel above  $A_c$ , the carbides dissolve, and the chromium carbide  $\text{Cr}_3\text{C}_2$  is converted into  $\text{Cr}_7\text{C}_3$  and metallic chromium. The higher the temperature, the more the change proceeds in this direction. On cooling, the reverse change takes place only slightly, and the result is that at the ordinary temperature a steel is produced containing the carbides, chromium and the tungstide all in solid solution. This, according to Professor Honda, is the constitution of the hardened steel. The self-hardening property is conveniently studied by the temperatures of the transformations, while the degree of tempering on later heating is best studied by means of magnetic heating curves. The tempering takes place in two steps—one at about 400 deg. and the other above 700 deg. Professor Honda concludes that self-hardening and resistance to tempering depend primarily on the quantity of  $\text{Cr}_7\text{C}_3$  dissolved in iron containing chromium and tungstide. These properties increase both with chromium and carbon and with rise of temperature. The function of tungsten appears to consist in lowering the temperature, at which self-hardening begins to be manifest. When this element exceeds 12 per cent. it exists as fine globules of tungstide  $\text{Fe}_2\text{W}$ , and these are directly related to the cutting efficiency of the tool.

### Explosion on Oil-Tank Barge

SEVEN MEN WERE KILLED, and four slightly injured as the result of an explosion last week on the oil-tank barge "Warwick." The vessel belonged to the Cunard Company, and was lying off Odessa Wharf, some distance from the bank, undergoing repairs. She had been emptied of oil, but her tanks, it is believed, would still contain gaseous fumes given off by their former contents, and these would form with air a highly dangerous explosive mixture. It is surmised that a light came in contact with this mixture, resulting in an explosion, which hurled the men with terrific force into the air, flinging them, some burned and maimed, others practically uninjured, into the river.

At the inquest on Tuesday J. F. Newall, foreman lighterman of the Anglo-American Oil Co., said that the barge was loaded at Thameshaven with low-flash petroleum on September 17, and came to Silvertown and was unloaded the following day. It was cleaned at Purfleet on Sept. 23, the day before the explosion. After the tank was cleaned no test was made to see whether it contained any vapour. H. Layzell, who came up with the barge from Purfleet, said that he saw men with acetylene apparatus going on board, and he suggested that it was rather risky, but no notice was taken of him.

The Coroner, in summing up, said that he thought that a tank about to be lifted out of a barge, having contained petrol, should be examined by some authority, who should make perfectly certain that it was safe to use a light during the repair. It was not sufficient for a foreman or anyone else to give directions in a casual way. The jury returned a verdict of "Accidental death," and added a rider to the effect that more precautions should be taken by both sides.

A recent report of the BERLIN CHAMBER OF COMMERCE makes special reference to the progress of the American dyestuff industry. England, in this connection, is stated to be unwilling to resume her former business relations, but a doubt is expressed as to whether America is not a shut market henceforth in view of the strides that synthetical chemical manufacture is making. As to the position of German dyemakers, it is claimed to be favourable, with the very important reservation that there is a shortage of raw material and fuel. Moreover there are labour difficulties, and the effect of shorter hours is a greatly decreased production.

## From Week to Week

There was a loss of £700 on the BRITISH ASSOCIATION CONFERENCE at Cardiff.

All restrictions on the importation of SULPHATE OF COPPER into Greece were removed as from August 29.

Production at SWANSEA TINPLATE WORKS is hampered by a shortage of acids due to the strike at the local acid works.

Among the exhibits at the NORWEGIAN INDUSTRIES FAIR, which was opened at Christiania last month, were chemical products, oils and colours, and glass.

The COMMONWEALTH GOVERNMENT has increased its offer of a reward for the discovery of petroleum oil in commercial quantities in Australia from £10,000 to £50,000.

Mr. ERNEST J. P. BENN is opening the autumn session of the London Central Y.M.C.A. Hall in Tottenham Court Road, on Tuesday, October 5, at 7.30. Sir Hugh Bell, Bart., will take the Chair.

A strong feeling was expressed at a meeting of the SHEFFIELD PHARMACISTS' AND ASSISTANTS' Section of the Workers' Union, last week, that a scheme for limitation of apprentices should be introduced as soon as possible.

A consignment of 1,000 TONS OF SPELTER arriving at Swansea has been distributed among the galvanising works. Four spelter works in the locality are shut down, and the 3,500 workmen are engaged in other industries.

Among the new industries established in SOUTH AFRICA during the year 1919 were aluminium works, ammonia, asbestos cement, bone char, briquettes or patent fuel, cream of tartar, dextrine, lacquer and gold size, &c.

CHEMICALS AND PERFUMERY to the value of £2,292,023 were imported into Egypt in 1920 against £1,340,692 in 1919; dyestuffs, tanstuffs and colours, £477,685 against £279,266; hides, skins and leather goods, £725,355 against £288,262.

A simple method of making LIQUID METAL POLISH has been devised by Hopol, Ltd., of Sandbach, Cheshire. The manufacture is a powder, called Hopol Powder, which when mixed with turpentine substitute (white spirit) is said to make a satisfactory polish.

Miss MARION B. RICHARDS, M.A., D.Sc., first assistant in chemistry at Aberdeen University, has been appointed assistant to Dr. R. H. A. Plimmer, of the Bio-Chemical Department, Rowatt Research Institute in Animal Nutrition at Craibstone Experimental Farm.

Sir FREDERICK CHANCE, of Morton, Carlisle, has given £200 for the establishment of a technical library in connection with the Carlisle School of Chemistry, towards the foundation of which he has already given £6,000 in memory of two sons who were killed in the war.

The directors of the African & Eastern Trade Corporation announce that they have entered into a CONTRACT WITH LEVER BROTHERS to bring under one control their various businesses and Lever Brothers' West African interests, including those of the Niger Company.

A roadside BENZOL FILLING STATION, the fifth of a number which are being installed in various parts of the country by the Automobile Association and Motor Union, has been opened at Blue Boar Corner, on the London Road, nine miles from Coventry and two from Dunchurch.

Arrangements are now being made for the experimental production of POWER ALCOHOL on a considerable scale in India. Rice straw is to be used in the first place, but other cheap raw materials are available, and it is believed that within two or three years large supplies will be available to be imported into this country.

Following an explosion, a TANK CONTAINING 20,000 GALLONS OF TAR burst into flames at the South Suburban Gasworks at Sydenham on Thursday, September 23. The London Fire Brigade succeeded in preventing the fire from spreading to the large amount of inflammable material in the neighbourhood. A tank attendant named Peckham was severely burned.

Dr. P. V. PAULI, one of the pioneers of the German "heavy" chemical industry, died on August 20, aged 84. Dr. Pauli spent several years in this country in the early sixties, working with the Union Alkal Works, Ltd., Evans and MacBride, and the Sulphate of Copper Company. In 1880 he joined the firm of

Meister, Lucius & Brüning, was elected to the board of management, and remained at the head of that undertaking until he retired in 1900.

Mr. H. TALBOT, B.Sc., A.R.C.Sc., has been appointed manager of Centrifugal Separators, Ltd., of 8, Iddlesleigh House, Caxton Street, London, S.W. 1, manufacturers of the Gee Separators, the operation of which those who attended the Annual General Meeting of the Society of Chemical Industry this year at Newcastle had an opportunity of witnessing. Mr. Talbot, who has been the hon. secretary of the Chemical Engineering Group of the Society of Chemical Industry since its inception, will continue to carry out that work.

The firms of Samuel Barrow and Brother Ltd., leather merchants and tanners, Weston-street, Bermondsey, and Hepburn, Gale, and Ross Ltd., manufacturers of leather belting and goods, Grange-road, Bermondsey, have formed AN AMALGAMATION of their businesses, and the new firm has been registered in the name of Barrow, Hepburn, and Gale Ltd., with a nominal capital of £2,500,000, in £1 shares. The chairman of directors is Mr. Samuel Barrow, a nephew of the late Mr. Samuel Barrow, M.P., founder of the firm of Samuel Barrow and Brother Ltd.

MR. HENRY BASSETT, who joined the Society of Chemical Industry in 1884 and whose death took place on August 30, at the age of 83, was one of the few remaining pupils of Hofmann at the Royal College of Chemistry. After serving many years as assistant to Mr. F. A. Manning, he took up consulting work in London in 1894, devoting his attention more particularly to non-ferrous alloys and to the testing of anthracene. He was the author of many communications to the Chemical Society, including a paper in 1864 on ethyl orthocarbonate, and he carried out a number of investigations on the corrosion of alloys, &c., in connection with his work as consulting chemist.

Speaking with reference to the proposed British Research Association for the GRAY AND MALLEABLE CAST-IRON AND ALLIED INDUSTRIES, Mr. Thomas Vickers, the acting secretary of the Provisional Committee stated that this industry was in a peculiarly backward state in relation to research. Manufacturers were for the most part still working on the old lines laid down by Ramur. During the war Dr. W. H. Hatfield, of Sheffield, an authority in the malleable cast-iron trade, was commissioned by the Government to investigate the condition of the whole of the foundries, about 3,000, in the country, and he found fewer than a dozen in which work was being conducted on scientific principles. By the formation of an association it was hoped manufacture would be conducted on methods which would prove both more economical and productive.

By order of the Court of Chancery, the freehold and leasehold works of the CHINA CLAY CORPORATION, LTD., near Ivybridge, South Devon, are to be submitted as a going concern by Goddard & Smith at their auction rooms at 196, Piccadilly, on October 20, unless an acceptable offer is made meanwhile. The freehold consists, briefly, of Cantrell Farm, extending to about 64 acres, with two well-constructed china clay areas, numerous buildings and a stone quarry. The whole adjoins the Great Western Railway main line. Eight miles of private railway line give access to the leasehold on Dartmoor embracing some 1,300 acres, with mining rights in the beds of china clay, china stone, also the beds of china clay under parts of Harford and Ugborough Moors adjacent. This portion is held from the Prince of Wales and Duke of Cornwall for 27 years unexpired at a rental of £500 per annum, merging in the Royalties.

A conference on an INTERNATIONAL CATALOGUE OF SCIENTIFIC LITERATURE was opened at the Royal Society, London, on Tuesday. The delegates present represented Denmark, France, Holland, Italy, Japan, Norway, Sweden, Switzerland, the United States, India and Great Britain. The Conference, which has sat for two days, has considered the working of the old catalogue, and is agreed upon its great utility to science, but serious financial difficulties have arisen owing to the withdrawal of the support previously given by Germany, Austria, and Russia. A financial committee has been appointed to consider the question. The Government gave a dinner at the Carlton Hotel on Wednesday to the delegates. Sir Alfred Mond, M.P., presided, and among those present were: Sir William Pope, Sir Dugald Clark, F.R.S., and Sir Robert Hadfield, F.R.S. The delegates included Sir Arthur Schuster and Professor H. E. Armstrong.



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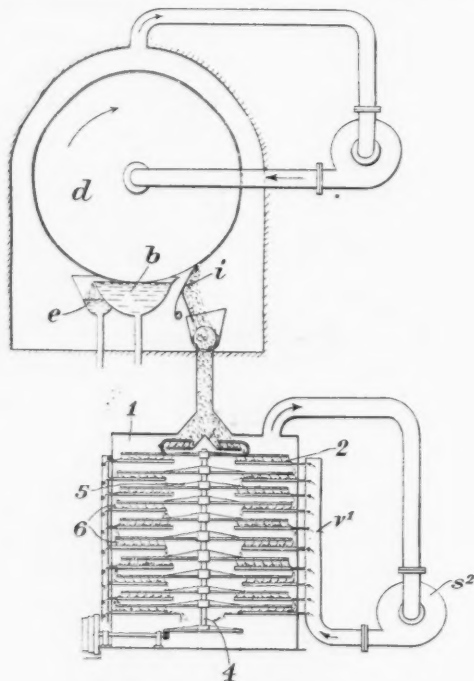
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# Patent Literature

## Abstracts of Complete Specifications

150,068. DRYING PROCESSES AND APPARATUS THEREFOR. T. Boberg and Techno-Chemical Laboratories, Ltd., "Fairlawn," Clarence Road, Clapham park, London, S.W. 4. Application date, May 27, 1919.

The apparatus is a modification of that described in No. 149,055 (See THE CHEMICAL AGE Vol. III., page 292), for drying substances, more especially peat. In that specification, the substance is spread in a thin film on a heated surface, and the vapour evolved is used to heat the surface on its reverse side, after its temperature has been raised a small amount by compression. The drying operation is now carried out in two stages, the water content being reduced to about 80 per cent. at the first stage and to about 10 per cent. at the second stage. This is effected by using two drying drums each similar to that described in No. 149,055. If the material after the first drying is powdery and will not adhere to the drum, the apparatus shown in the illustration may be used. The wet peat is supplied to a trough *b* having an overflow *e*, and is carried round on the surface of the drum *d* where it is dried as previously described. The powdery material is removed by a scraper *i* and passes downwards on to the uppermost of a series of superposed platforms 2 in a cylinder 1. A



150,068.

vertical rotating shaft 4 is provided with a series of arms 5, carrying brushes or scrapers 6 to distribute the material on the platforms 2. The platforms each have radial slots through which the material falls in succession to the bottom of the casing. The vapour driven off is slightly compressed by the compressor *s*<sup>2</sup> to raise its temperature, and is then passed to the header *v*<sup>1</sup>, and thence to the interior of the hollow platforms to heat the latter.

150,113. ORES, WATER CONCENTRATION OF. W. M. Martin, Meadowcroft, West Trewirgie, Redruth, Cornwall. Application date, June 16, 1919.

Ores are concentrated by passing the pulp over a number of superposed stepped fluted or frosted glass surfaces, periodically stopping the flow of pulp, and then allowing it to flow again. Water is passed over the glass surfaces between the flows of pulp, the stopping of the pulp flow and starting of the

water flow being timed automatically by the tipping over of balanced vessels into which water flows at a constant predetermined rate.

150,116. ALUMINOUS MATERIALS, PROCESS FOR PURIFYING. The Carborundum Co., Ltd., Trafford Park, Manchester. (From O. Hutchins, Niagara Falls, N.Y., U.S.A.). Application date, June 18, 1919.

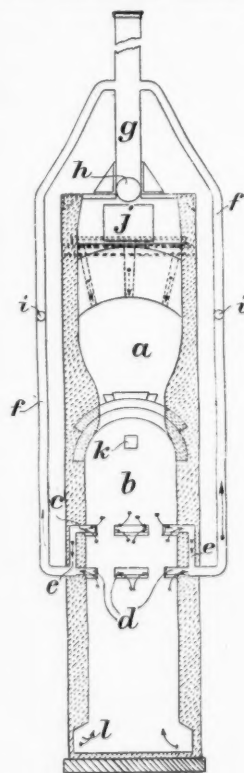
Aluminous abrasive material produced in the electric furnace usually contains 92 to 96 per cent. alumina, 2 to 4 per cent. of titanium oxide, and smaller amounts of iron oxide and silica. The object is to produce a material containing over 97 per cent. of alumina, 0.2 to 1.3 per cent. of titanium oxide, and less than 0.8 per cent. each of iron oxide and silica. Calcined bauxite is fused in an electric furnace with sufficient coke to yield a product containing at least 90 per cent. of alumina. This product is crushed, separated from metallic impurities, and reheated with sufficient carbon to reduce the iron oxide, titanium oxide, and silica to the proportions mentioned above. The abrasive produced is less tough than the ordinary variety, but much sharper, and is particularly applicable for the manufacture of grinding wheels when used with a ceramic bond.

150,127. NITROGEN, FIXATION OF. E. C. R. Marks, London. (From Nitrogen Products Co., 55, Canal Street, Providence, R.I., U.S.A.). Application date, June 23, 1919.

The apparatus is for fixing nitrogen as cyanide by heating briquettes composed of carbon, iron, and sodium carbonate. When the briquettes are fed by gravity downwards through the vertical retort it has been found that they tend to adhere to the retort walls and impede the downward movement. It is now found that this is due to the solidification, somewhat below 600° C., of the sodium cyanide contained in the briquettes. The adhesion of the briquettes to the retort walls is prevented by providing an abrupt enlargement at the point at which the sodium cyanide solidifies. The enlarged portion extends downwards about two or three diameters of the retort. The heating zone of the retort is formed of a refractory alloy such as iron and nickel, or iron, chromium, nickel, and manganese.

150,157. KILNS. W. Somerville. The Cottage, Hindlow, Buxton. Application date, July 23, 1919.

The kiln is for burning limestone, dolomite, or the like. The material is fed through the charging doors *j* into the chamber *a* above the burning zone *b*. Fuel is fed through the openings *h*, and the lime is withdrawn through the openings *l* at the bottom. Annular conduits *c*, *d*, are connected by an annular space *e*, and communicate with uptakes *f*, which terminate in flues *g*. In operation, the dampers *h* are opened until the fire has become incandescent, after which they are closed and the dampers *i* opened, so that carbon dioxide passes into the annular conduits *c*, *d* below the fire proper, and is carried through the uptakes *f* by air which enters at the openings *l*, and is heated by contact with the hot lime at the foot of the furnace. Air for combustion is drawn downwards through the fire. The withdrawal of carbon dioxide at the conduit *c*, *d* avoids any re-absorption by the burnt lime



150,157.

150,214. HYPOCHLORITES, ELECTROLYTIC APPARATUS FOR THE DIRECT PRODUCTION OF. P. Pestalozza, Via Canova, 19, Milan, Italy. Application date, December 19, 1919.

The apparatus comprises a vat subdivided into a number of cells by transverse partitions, part of each partition being composed of graphite or carbon, which thus forms an anode for one cell and a cathode for the adjacent cell. The chloride solution forming the electrolyte passes continuously through the cells by openings which are alternately at opposite ends of the partitions. Each cell is provided with a cooling pipe of looped form immersed in the cell, and the pipes of each cell are connected by elastic couplings which facilitate their assemblage.

NOTE.—Specification 132,529 (Soc. des Acieries et Forges de Firminy), which is now accepted, was abstracted in THE CHEMICAL AGE when it became open to inspection under the International Convention. See Vol. I, page 604.

### International Specifications Not yet Accepted

146,819. CYANIDES. Mitsubishi Kogyo Kabushiki Kaisha, 1, Ithome, Yayesu-cho, Kojimachi Ku, Tokyo. (Assignees of T. Hara 727, Gotenyama, Shinagawa, Machi, Ebara Gun, Tokyo Fu, Japan). International Convention date, July 7, 1919.

A catalyst for use in the production of cyanides by fixation of nitrogen consists of carbon soaked in an iron salt solution and then heated alone or in steam or carbon monoxide. The iron salt is reduced to oxide or to the metal. This substance is then heated with sodium carbonate or an alkaline earth oxide or carbonate, in contact with nitrogen.

146,839. COKE OVENS, TREATING WASTE GASES FROM. Rombacher Huttenwerke 6, Rheinzollstrasse, Coblenz, Germany. (Assignees of J. I. Brown, 62, Bismarkstrasse, Charlottenburg, near Berlin.). International Convention date, October 24, 1914.

Coke oven gases are treated for the recovery of tar, benzole, ammonia, &c., then compressed and water and carbon dioxide removed, and then further compressed and cooled till all the gases except hydrogen are liquefied. The liquid is fractionated to obtain nitrogen, carbon monoxide, methane, and ethylene. Alternatively, the ethylene may be extracted with salt solution, alcohol, or acetone before liquefaction, or ethylene and carbon dioxide may be absorbed together by a single liquid.

146,860. SACCHARIFYING CELLULOSE. A. Wohl, Langfuhr, Dantzig, Germany. International Convention date, April 7, 1917.

Saccharification of materials containing cellulose is effected under pressure, whereby the amount of concentrated hydrochloric or sulphuric acid required is reduced.

146,865. GLYCERINE. Elektro-Osmose Akt.-Ges. (Graf. Schwerin Ges.) 35, Lindenstrasse, Berlin. International Convention date, January 17, 1919.

Acid residues in crude glycerine are removed by placing the glycerine in the cathode compartment of a cell having an electro-positive diaphragm; bases are removed by placing the glycerine in the anode compartment of a cell having an electro-negative diaphragm. The purification is effected by electric endosmose. Details of the treatment are given. The glycerine may be subjected to preliminary purification with barium carbonate and sulphuric or oxalic acid in the electrolytic cell. Colloidal or absorptive materials may also be added to assist in separating the pigments.

146,869. PYRIDINE BASES. Farbwerke vorm. Meister, Lucius and Bruning, Hoechst-on-Main, Germany. International Convention date, June 22, 1917.

A mixture of paraldehyde and dilute ammonia is heated in an autoclave to a temperature below 200°C., and the reaction mass is distilled with steam yielding a product which is chiefly 2-methyl-5-ethylpyridine.

146,871-2. DYES. Farbwerke vorm. Meister, Lucius and Bruning, Hoechst-on-Main, Germany. International Convention dates, June 30 and April 23, 1914.

146,871. Diazo-sulphonic or diazocarboxylic acids of the benzene or naphthalene series (other than *o*-oxydiazo compounds), *e.g.*, aniline-*o*-sulphonic acid, are coupled with 2-amino-7-naphthol to obtain monoazo dyes, which dye wool yellowish-brown shades which may be after-treated with formaldehyde.

146,872. Trisazo dyes which may be used for dyeing the cotton fibres of half-wool goods red shades, leaving the wool unaffected, are produced by diazotising and coupling with resorcin or *m*-aminophenol the secondary disazo dyes prepared by coupling diazo compounds with *p*-aminobenzoyl-2:5:7-aminonaphthol sulphonic acid, rediazotising and coupling with an aminoarylacidyl-2:5:7-acid.

146,898. LUBRICATING OILS. M. Melamid, 56, Lorettostrasse, Freiburg, Breslau, Germany. International Convention date, March 11, 1919.

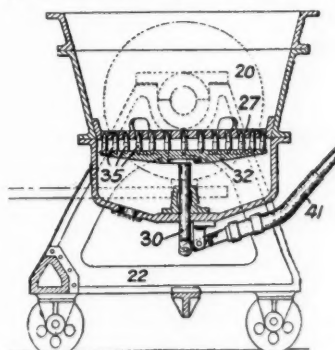
Tar oils from low temperature tars, *e.g.*, the 350°-450° fraction, are treated with anhydrous naphthalene sulphonic acid at 150°C., and sufficient ethyl alcohol to esterify the phenolic constituents. The products are suitable for lubricating.

146,919. ALUMINIUM NITRIDE. Armour Fertilizer Works, Union Stock Yards, Chicago. (Assignees of M. Shoeld, 725, Sheridan Road, Chicago.) International Convention date, July 10, 1919.

Briquettes composed of alumina, carbon, and a binder are mixed with larger lumps of carbon or other chemically inert electrical conductor. The mixture passes downwards through an electric shaft furnace, and the carbon lumps act as heating resistances and prevent fusion of the briquettes. Nitrogen is passed upwards through the furnace, and is preheated by passage through the treated material, while the spent gas preheats the entering material. The solid product is screened to separate the carbon lumps which are used again.

146,936. ROASTING FURNACES. Mining & Metallurgical Processes Proprietary, Ltd., 360, Collins Street, Melbourne. (Assignees of G. Rigg, 360, Collins Street, Melbourne.) International Convention date, July 9, 1919.

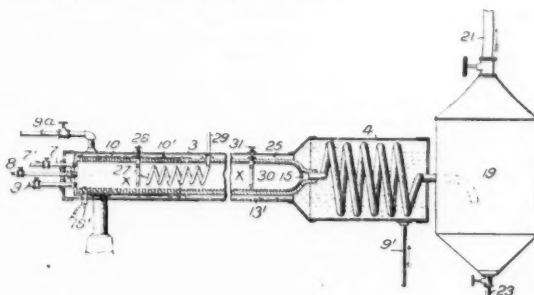
A furnace for the desulphurisation of lead ores comprises a pot 20 mounted on trunnions on a truck 22 and having a grate 27. A plate 32 carries teeth 35 in alignment with the grate



146,936

apertures, and is operated by a hand lever 41 so as to break up the clinker periodically and ensure a more uniform blast.

146,939, 146,942. ORES, TREATING. W. E. Trent, 908, G Street, Washington, U.S.A. International Convention date, June 25 and July 10, 1919.

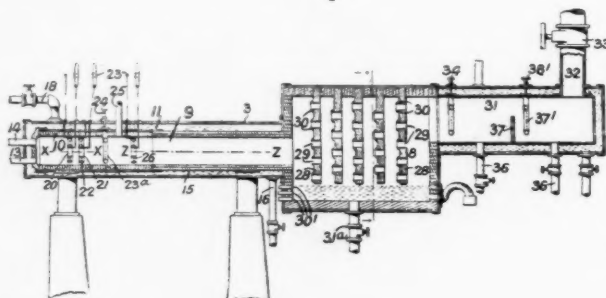


146,939

146,939. The apparatus is applicable to oxidising, reducing, volatilising, chloridising, or combined heat and chemical treat



ment. The finely divided ore, preferably liquefied by adding water or fuel oil, is passed through the pipe 29 into the chamber 10 where it is acted upon by the flame produced by oil and air supplied by the pipes 8, 7, respectively. A treating agent may be supplied through the pipe 9. The flame temperature is regulated by a water jacket 25 and a water spray 27. The material is carried along and acted upon by the blast, water is added by the spray 30, and the mixture passes through the condenser 4 to the tank 19, where gases and sludge are removed through pipes 21, 23, respectively. If iron oxide is treated in a reducing blast, metallic iron particles are obtained; if iron sulphide is treated in excess of oxygen, sulphur trioxide is produced.



146,942

146,942. The general arrangement is similar to that described in 146,939. The material is fed through the pipe 25, and air and treating agent through pipes 13, 14. The air is heated by electric arcs 20, 26, and the products pass into a chamber 8 provided with baffles 28. Molten matter is intercepted and collects in the bottom, and the separate layers may be drawn off through pipes 30'. Vapour is fractionally condensed in the chamber 31 by water sprays 33, 37', and condensates are drawn off by the pipes 36. When chloridising gold, silver or lead ores, common salt may be supplied through the pipe 14.

146,956. ALKYL HYDROGEN SULPHATES, ALCOHOLS AND ESTERS. S. B. Hunt, Mount Kisco, N.Y., U.S.A. (Assignee of C. Ellis, G. Cohen, A. Breslauer, and H. Asher, executors of M. J. Cohen.) International Convention date, March 20, 1917.

Gases produced in cracking or distilling petroleum oils, and which contain olefins, are passed through an absorption tower containing sulphuric acid of sp. gr. 1.54 to 1.84 and temperature 10°C. to 20°C. Alkyl hydrogen sulphates are produced and the acid liquor is mixed with water to hydrolyse the sulphates. The alcohols are separated by steam distillation, and may be esterified with acetic acid, &c.

146,957. ALKYL HYDROGEN SULPHATES, ALCOHOLS AND ESTERS. S. B. Hunt, Mount Kisco, N.Y., U.S.A. (Assignee of M. D. Mann, 120, West 5th Avenue, and R. R. Williams, 232, West 5th Avenue, both in Roselle, N.J., U.S.A.) International Convention date, March 11, 1919.

The process described in No. 146,956 is modified by absorbing the gas under pressure in a mixture of sulphuric acid and petroleum oil.

146,974-5. LUBRICATING OILS. Deutsche Erdöl Akt.-Ges., 112, Kurfürstenstrasse, F. Seidenschur, 30, Suarezstrasse, Charlottenburg, and K. Koettwitz, 81, Kommandantenstrasse, Lichterfelde, all in Berlin. International Convention dates, November 6 and March 3, 1916.

146,974. Brown coal, shale, or lignite is treated in a gas producer to a smouldering process effected partly by external heat and partly by hot gases, to obtain a tar which is distilled with superheated steam to yield lubricating oils of high flash point.

146,975. Petroleum pitch is distilled in small stills at 350°C. to 425°C. at reduced pressure, and superheated steam may also be passed into the still. Lubricating oils are thereby separated.

146,992. INDIA-RUBBER. Goodyear Tyre & Rubber Co., 1144, East Market Street, Akron, Ohio, U.S.A. (Assignees of C. W. Bedford, 1144, East Market Street, Akron, Ohio, U.S.A.) International Convention date, May 29, 1917.

Rubber is mixed with glue which has been decomposed by natural fermentation, or hydrolysis preferably by basic reagents. The proteid after hydrolysis with alkalies or alkaline earths may be treated with carbon dioxide, mixed with water, and incorporated with the india-rubber in the proportion of 5 to 30 per cent.

146,993. INDIA-RUBBER. Goodyear Tyre & Rubber Co., 1144, East Market Street, Akron, Ohio, U.S.A. (Assignees of R. C. Hartong, 1144, East Market Street, Akron, Ohio, U.S.A.) International Convention date, October 25, 1918.

India-rubber is mixed with a colloidal solution, e.g., glue, filling and colouring materials are added, and a substance to prevent the glue from hardening, such as pine oil, asphaltic oils, turpentine, or glycerine. The rubber is then dried and vulcanised.

147,000. PYRIDINE BASES. Farbwerke vorm. Meister, Lucius, and Bruning, Hoechst-on-Main, Germany. International Convention date, August 30, 1918. Addition to 146,869. (See above.)

Paraldehyde is heated with aqueous ammonia and an ammonium salt, such as ammonium chloride or acetate; a product is obtained which is chiefly 2-methyl-5-ethyl-pyridine.

147,001. ANTHRAQUINONE DERIVATIVES. Farbwerke vorm. Meister, Lucius, and Bruning, Hoechst-on-Main, Germany. International Convention date, July 11, 1918.

Condensation products are obtained by treating 1-nitro-2-methyl-anthraquinone, 1:5-dinitro-2-methylantraquinone, 1-nitro-2-ethylantraquinone, 1-nitro-2-methyl-5:6:7:8-tetrachloranthraquinone, or the like, with fuming sulphuric acid. The last mentioned anthraquinone derivative is obtained by treating tetrachlorophthalic anhydride with toluene to obtain methyltetrachlorbenzoylbenzoic acid which is then converted into 2-methyl-5:6:7:8-tetrachloranthraquinone and nitrated.

147,020. SEPARATING DUST FROM GASES. Manufactures de Produits Chimiques du Nord, Etablissements Kuhlmann, 117, Boulevard Haussmann, Paris. International Convention date, May 6, 1914.

Gases derived from the roasting of ores are treated for the removal of dust by passing them through rows of chains which may be magnetized. Part of the dust is deposited on the chains and part in the intermediate spaces. The chains of a row are fastened together and may be shaken at intervals by wires. The deposited dust may be removed by a conveyor at the bottom of the casing.

#### LATEST NOTIFICATIONS.

151,259. Alumina from aluminium nitrate solutions. Norsk Aktieselskab for Elektro-Kemisk Industri-Hypotekbank. September 19, 1919.

151,000. Dyestuffs. Cassella & Co. Ges., L. August 27, 1919.

151,002. Purifying, dehydrating or concentrating aqueous solutions of mineral, vegetable, or animal colloids or freely electrically conducting substances. Elektro-Osmose Akt.-Ges. September 11, 1919.

151,014. Photographic sensitizers. Amiot, J. September 15, 1919.

151,016. Manufacture of condensation products of formaldehyde and carbamide derivatives.

#### Specifications Accepted, with Date of Application

127,831. Centrifugal pumps, especially for acids and corrosive liquids. W. P. Thompson. (Union Espagnole de Fabriques D'Engrais De Produits Chimiques et de Superphosphates.) June 6, 1919.

131,898. Molybdenum compounds from yellow lead-ores, Extraction of. Deutsche Molybdaenwerke Ges. October 2, 1916. (Addition to 21,039/19.)

133,666. Hydrogenation of benzene. Dayton Metal Products Co. October 5, 1918.

150,762. Furnaces or kilns. R. J. Anderson. April 4, 1919.

150,785. Evaporation of liquids, Apparatus for effecting, or the recovery of vapours or gases developed therefrom. F. Merz. June 4, 1919.

- 150,786. Extracting water from any material containing it. Method of. F. Merz. June 4, 1919.  
 150,787. Producer gas, Generation and utilization of. A. H. Lynn and N. E. Rambush. June 4, 1919.  
 150,802. Hydrogenating oils, Process and apparatus for. J. S. Withers. (*National Electro-Products, Ltd.*) June 5, 1919.  
 150,807. Drying processes. T. Boberg and Techno-Chemical Laboratories, Ltd. June 6, 1919.  
 150,836. Nitric acid, Processes of Making. British Thomson-Houston Co. (*General Electric Co.*) June 17, 1919.  
 150,917. Mercuric oxide, Apparatus for the manufacture of,—by the decomposition of mercurous nitrate. G. Brusa and Dr. V. Borelli & Co. October 30, 1919.  
 150,940. Stills. A. C. Jewell. February 3, 1920.

#### Applications for Patents.

- Alluvial Mining Machinery Co. Means for handling and transporting china-clay-bearing material, &c., in production of china-clay. 27,212. September 24.  
*Badische Anilin & Soda Fabrik.* Manufacture of hydrochloric acid. 27,122. September 23.  
 Baumgartner, O. Filtering-media for liquids. 27,123. September 23. (Austria, November 6, 1915.)  
 Commin, F. J. Apparatus for production of cyanogen compounds or cyanides. 27,045. September 22.  
 Davis, J. E. Apparatus for determining calorific values of coal gas, &c. 27,157. September 23.  
 Dorling, J. W. Preparation of barium sulphide for depilatory purposes. 27,341. September 25.  
 Ellison, F. O. Manufacture of disinfectant, &c. 26,972. September 22.  
 Imray, O. (*Soc. of Chemical Industry in Basle*). Manufacture of soluble derivatives of camphoric acid. 26,924. September 21.  
 Johnson, J. Y. (*Badische Anilin & Soda Fabrik*). Manufacture of Magrath, H. J. Softening, sterilising, &c., water. 26,223. September 13.  
 Metallbank und Metallurgische Ges. Production of metal alloys 26,627. September 17. (Germany, December 22, 1919.)  
 Miller, W. J. Feeding glass. 26,247. September 13. (United States, September 23, 1919.)  
 „ Apparatus for manufacturing glass articles. 26,248. September 13. (United States, September 23, 1919.)  
 Noeggerath, J. E. Method of pumping or propelling semi-solids by viscosity pumps. 26,557. September 16.  
 Perry, W. P. Converting cellulosic and ligneous material into sugars. 26,542. September 16.  
 Pick, S. Manufacture of solid fuel and distillation of tar. 26,568. September 16.  
 Pickard, W. Drills or drilling machines. 26,607. September 17. hydrochloric acid. 27,122. September 23.  
 Reed, C. J. Process of making sulphuric acid. 26,802. September 20.  
 Rhodes, C. W. Centrifugal mechanism. 26,722. September 18.  
 Riccio, A. Chill-casting pure aluminium and its alloys. 26,822. September 20.  
 Roerig, A. Manufacture of acetylcellulose. 27,158. September 23.  
 Roiboul, M. de. Fusing and casting silica, alumina, &c. 26,357. September 14. (France, June 15.)  
 Roiboul, M. de. Manufacture of filaments or threads of silica, alumina, &c. 27,183. September 24. (France, June 16.)  
 Skipsey, A. Vulcanisation of rubber, &c. 27,019. September 22.  
 Soc. Anon. l'Azote Français. Process of recovering nitrous vapours. 27,161. September 23. (Switzerland, July 4.)  
*Soc. of Chemical Industry in Basle*. Manufacture of soluble derivatives of camphoric acid. 26,924. September 21.  
 Strafford, W. W. Manufacture of solid fuel and distillation of tar. 26,568. September 16.  
 Thompson, W. P. (*Gish*). Treating hydrocarbons for explosive engines. 26,405. September 15.  
 Thomson, D. Extraction of proteids from whey. 26,239. September 13.  
 „ Preparation of proteid substances from natural solid proteids. 26,240. September 13.  
 Wallace, G. W. Apparatus for distilling carbonaceous materials. 27,278. September 24.  
 „ Process for carbonising carbonaceous materials. 27,279. September 24.

#### Books Received

- THE CARBOHYDRATES AND ALCOHOL. By Samuel Rideal and Associates. London: Bailliere, Tindall & Cox. Pp. 219. 12s. 6d. net.  
 TECHNICAL HANDBOOK OF OILS, FATS AND WAXES. By P. J. Fryer and F. E. Weston. Cambridge University Press. Pp. 282. 15s. net.  
 GENERAL REPORT ON THE TRADE AND ECONOMIC CONDITIONS OF TURKEY FOR THE YEAR 1919. By Captain C. H. Courthope-Munroe. London: H.M. Stationery Office. Pp. 191. 2s. net. (Cmd. 942.)

## Company News

MAJOR & CO.—An interim dividend has been declared of 3½ per cent. on the preferred ordinary shares.

BRITISH MOTOR SPIRIT.—An interim dividend has been declared of 2½ per cent., payable on October 30.

STEEL COMPANY OF CANADA.—A dividend has been declared of 1½ per cent. on ordinary shares for the quarter ending September 30, 1920, payable on November 1.

ASSAM OIL.—An interim dividend has been declared for the half-year ended June 30 at the rate of 7 per cent. per annum on the 7 per cent. preference shares, payable on October 1.

AMERICAN CYANAMID.—A quarterly dividend has been declared of 1½ per cent. on the preferred stock, payable in New York on October 1 to holders of record on September 22.

NITRATE RAILWAYS.—An interim dividend has been declared at the rate of 3½ per cent. (7s. per share), less tax, payable on November 1, on the ordinary (unconverted) and the preferred converted ordinary shares.

SHEEPBRIDGE COAL & IRON CO.—The net profit for the year ended June 30 last amounted to £184,039, against £156,602 for the previous 12 months. With the addition of £33,374 brought in, the available balance is £217,413. Dividend 10 per cent., tax free (against same), and again £50,000 is placed to reserve. The carry-forward is £33,561.

ELLIOTT'S METAL.—A dividend has been declared of 10 per cent. (2s. per share), less tax, for the half-year, making 15 per cent. for the year. £30,000 has been placed to the reserve fund (bringing it up to £140,000) and £5,000 to an employees' welfare fund. After providing for excess profits duty and corporation tax, £10,888 remains to be carried forward.

BROKEN HILL PROPRIETARY.—A circular dated Melbourne, September 22, states that in order to provide for additions to the present plant at the Newcastle Steelworks the directors propose to make an issue of £1,500,000 7 per cent. debentures to be issued at 97 per cent. Among the chief additions to be made are: (a) A further blast furnace, making four in all, with the additional coke ovens required, together with the necessary accessories; (b) a by-product plant to be used in conjunction with the present and the new coke ovens; (c) a duplex steel plant; (d) a continuous mill for the production of billets and sheet bars; (e) a duplication of the present rod mill; (f) a sulphuric acid plant for the supply of acid in connection with the production of sulphate of ammonia, and also for galvanising in respect to wire drawing, wire netting, galvanised sheets, &c.

#### Future of the Chilean Nitrate Industry

IN reviewing the future of the Chilean nitrate industry the Valparaíso correspondent of the *Times* states that the present position and prospects for the near future are highly favourable. Prospects further ahead depend on the production of artificial nitrate. Although the industry is, in his opinion, likely to experience, at any rate for the present, a time of unexampled prosperity, he points out that it would be prudent for companies not to pay bumper dividends, but rather to put by large sums against a rainy day, and also to spend liberally on research. Although efforts have been made, especially by North American companies, to cheapen the cost of production, in other words, to get more out of the raw material, the industry has been too much inclined to jog along under old methods. Much remains to be done not only in research, but also in cheapening transport, and all this requires money. Such work will, however, make the industry better able to compete against artificial nitrate should evil days come. The salvation of the nitrate industry lies in the hands of the producers themselves. By spending in an organised manner on research, carried out by first class technical men, it is more than likely that means would be found to extract a maximum percentage of nitrate from the raw material, whilst the present cumbersome and antique methods of carriage from the nitrate grounds to the works would disappear. Everything done in these directions will help to bring down the cost of production, and it is to this that the industry will have to look in order to meet satisfactorily the competition, which is likely to be increasingly severe as time goes on.

# Market Report and Current Prices

Our Market Report and Current Prices are exclusive to THE CHEMICAL AGE, and, being independently prepared with absolute impartiality by Messrs. R. W. Greeff & Co. and Messrs. Chas. Page & Co., Ltd., may be accepted as authoritative. The prices given apply to fair quantities delivered ex wharf or works, except where otherwise stated. The weekly report contains only commodities whose values are at the time of particular interest or of a fluctuating nature. A more complete report and list are published once a month. The current prices are given mainly as a guide to works managers, chemists, and chemical engineers; those interested in close variations in prices should study the market report.

## Market Report

THURSDAY, September 30, 1920.

The depression in business which has been so evident during the last few weeks is still with us, and speaking generally, it is impossible to report any improvement in demand.

There is a certain export inquiry for staple chemicals but the volume of business passing is strictly limited.

### General Chemicals

ACETONE is unchanged in price and in steady demand.

ACID ACETIC.—Stocks are steadily reduced and there is no fluctuation in the price for spot delivery. Little is heard of forward commitments.

ACID CARBOLIC remains uninteresting, being purely a nominal market.

ACID CITRIC.—There has been no further reduction in price, but the business is very small.

ACID FORMIC is in good inquiry at recent figures.

ACID OXALIC is only in moderate demand, and makers' prices are maintained.

BLEACHING POWDER continues in good inquiry, but few reliable parcels are obtainable for early delivery.

COPPER SULPHATE.—There is a rather better demand and as makers state that the present price leaves them with a loss any revival in the export trade will no doubt immediately be followed by a higher price level.

FORMALDEHYDE.—Only a small volume of business is passing due to the fact that a number of principal users carry heavy stocks. The present price is probably below the intrinsic value of the article, and an unexpected improvement is not impossible.

LEAD SALTS.—A small business has been done for export, but the articles are generally, speaking, featureless.

POTASSIUM PRUSSATE is scarce for prompt delivery, and a rather higher rate is also being asked by foreign holders.

SODA CAUSTIC is inclined to be weaker in price owing to the realisation of second-hand parcels.

SODA BICROMATE.—Larger quantities are appearing in second-hands, and the market exhibits an easy tone.

SODA NITRITE passes slowly into consumption, with no apparent change in price.

SODA PHOSPHATE is steady at recent rates.

SODA PRUSSATE.—A limited business is passing for export, but in many directions the limits from overseas remain impracticable.

ZINC SALTS are quiet.

### Coal Tar Intermediates

There is very little to report this week, trade is very quiet as regards new business, and prices show little variation. As manufacturers are in the main well occupied for some little time ahead and there is little tendency towards business to be detected.

ALPHA NAPHTHOL.—The price continues steady and makers are well occupied.

ALPHANAPHTHALAMINE is only in quietly steady demand, without change in price.

BETA NAPHTHOL is in very light demand, and re-sellers are inclined to make concessions to clear their stocks.

DIMETHYLANILINE is in demand for forward delivery, and the price is firm.

H ACID.—Very little business has been done in this product for parcels due to arrive at full ruling figures.

NITRO BENZOLE.—A fair business has been transacted in this article, and it is without change in price.

PARANITRANILINE is inclined to be slightly easier, but there is very little spot material available.

PARAPHENYLENEDIAMINE is only in quiet demand, and is without change in price.

RESORCIN.—There have been some inquiries for the technical quality and a little business has been transacted.

### Coal Tar Products

There is very little change to report since last week. 90's BENZOL is still scarce, and quoted 3s. 10d. to 3s. 11d. in the North, with 4s. to 4s. 1d. in the South.

PURE BENZOL is worth 4s. 3d. per gallon.

CREOSOTE OIL remains unchanged at 1s. 1d. to 1s. 1½d. in the North, and 1s. 2d. to 1s. 2½d. in the South.

CRESYLIC ACID is slightly more active and prices are 3s. 10d. to 4s. for dark 95/97 per cent., with 4s. 6d. to 4s. 9d. for pale 97/99 per cent.

SOLVENT NAPHTHA is slightly firmer and is quoted 3s. 2d. on rails.

HEAVY NAPHTHA remains unchanged at 3s. 6d. per gallon.

NAPHTHALENE is somewhat freer, crude qualities selling from £14 to £24 per ton, refined is distinctly weaker, and is not worth more than £50 a ton.

PITCH.—The position is unchanged. The market is still firm with an upward tendency. London is quoted 222/6d. to 227/6d., f.o.b., East Coast 220/0d. to 225/0d., f.o.b., West Coast 215/0d. to 220/0d., f.o.b.

### Sulphate of Ammonia

The market is unchanged.

## Current Prices

### Chemicals

	per	£	s	d.	to	£	s	d.
Acetic anhydride .....	lb.	0	3	9	to	0	4	0
Acetone oil .....	ton	90	0	0	to	95	0	0
Acetone, pure .....	ton	120	0	0	to	125	0	0
Acid, Acetic, glacial, 99-100% .....	ton	105	0	0	to	110	0	0
Acetic, 80% pure .....	ton	85	10	0	to	87	10	0
Arsenic .....	ton	100	0	0	to	105	0	0
Boric, cryst. ....	ton	74	10	0	to	76	0	0
Carbolic, cryst. 39-40% .....	lb.	0	0	11½	to	0	1	0
Citric .....	lb.	0	4	6	to	0	4	9
Fluoric .....	lb.	0	0	7½	to	0	0	8
Formic, 80% .....	ton	115	0	0	to	120	0	0
Gallic, pure .....	lb.	7	6	0	to	0	7	9
Hydrofluoric .....	lb.	0	0	7½	to	0	0	8
Lactic, 50 vol. ....	ton	58	0	0	to	60	0	0
Lactic, 60 vol. ....	ton	67	10	0	to	70	0	0
Nitric, 80 Tw. ....	ton	41	0	0	to	44	0	0
Oxalic .....	lb.	0	2	3	to	0	2	4
Phosphoric, 1.5 .....	ton	65	0	0	to	67	0	0
Pyrogallic, cryst. ....	lb.	0	11	6	to	0	11	9
Salicylic, Technical .....	lb.	0	2	3	to	0	2	6
Salicylic, B.P. ....	lb.	0	3	1	to	0	3	2
Sulphuric, 92-93% .....	ton	8	10	0	to	8	15	0
Tannic, commercial .....	lb.	0	3	6	to	0	3	9
Tartaric .....	lb.	0	3	0	to	0	3	1
Alum, lump .....	ton	19	10	0	to	20	0	0
Alum, chrome .....	ton	88	0	0	to	90	0	0
Alumino ferric .....	ton	9	0	0	to	9	10	0
Aluminium, sulphate, 14-15% .....	ton	17	10	0	to	18	10	0
Aluminium, sulphate, 17-18% .....	ton	20	10	0	to	21	10	0
Ammonia, anhydrous .....	lb.	0	2	2	to	0	2	4
Ammonia, .880 .....	ton	43	0	0	to	45	0	0
Ammonia, .920 .....	ton	30	0	0	to	32	10	0
Ammonia, carbonate .....	lb.	0	0	7½	to	—		
Ammonia, chloride .....	ton	95	0	0	to	100	0	0
Ammonia, muriate (galvanisers) ..	ton	60	0	0	to	65	0	0
Ammonia, nitrate .....	ton	55	0	0	to	60	0	0
Ammonia, phosphate .....	ton	120	0	0	to	125	0	0
Ammonia, sulphocyanide .....	lb.	0	3	0	to	0	3	3
Amyl acetate .....	ton	420	0	0	to	425	0	0
Arsenic, white, powdered .....	ton	76	0	0	to	78	0	0
Barium, carbonate, 92-94% .....	ton	12	10	0	to	13	0	0
Barium, chlorate .....	lb.	0	0	11	to	0	1	0
Chloride .....	ton	30	0	0	to	31	0	0
Nitrate .....	ton	55	0	0	to	56	0	0
Barium Sulphate, blanc fixe, dry ...	ton	30	0	0	to	31	0	0
Sulphate, blanc fixe, pulp ...	ton	16	10	0	to	17	0	0
Sulphocyanide, 95% .....	lb.	0	1	6	to	0	1	8



	per	£	s.	d.	to	£	s.	d.
Bleaching powder, 35-37% .....	ton	28	0	0	to	29	0	0
Borax crystals .....	ton	41	0	0	to	42	10	0
Calcium acetate, Brown .....	ton	20	0	0	to	21	0	0
" Grey .....	ton	34	0	0	to	35	10	0
Calcium Carbide .....	ton	30	0	0	to	32	0	0
Chloride .....	ton	10	10	0	to	11	10	0
Carbon bisulphide .....	ton	65	0	0	to	67	0	0
Casein, technical .....	ton	75	0	0	to	80	0	0
Cerium oxalate .....	lb.	0	3	9	to	0	4	0
Chromium acetate .....	lb.	0	1	2	to	0	1	4
Cobalt acetate .....	lb.	0	8	6	to	0	9	0
Oxide, black .....	lb.	0	10	0	to	0	10	3
Copper chloride .....	lb.	0	1	3	to	0	1	6
Sulphate .....	ton	42	0	0	to	44	0	0
Cream Tartar, 98-100% .....	ton	245	0	0	to	250	0	0
Epsom salts (see Magnesium sulphate)								
Formaldehyde 40% vol. ....	ton	310	0	0	to	315	0	0
Formusol (Rongalite) .....	lb.	0	5	0	to	0	5	6
Glauber salts .....	ton	Nominal.						
Glycerine, crude .....	ton	70	0	0	to	72	10	0
Hydrogen peroxide, 12 vols. ....	gal.	0	2	9	to	0	2	10
Iron perchloride .....	ton	50	0	0	to	52	0	0
Iron sulphate (Copperas) .....	ton	4	0	0	to	4	5	0
Lead acetate, white .....	ton	85	0	0	to	87	10	0
Carbonate (White Lead) .....	ton	65	0	0	to	67	10	0
Nitrate .....	ton	65	0	0	to	67	0	0
Litharge .....	ton	57	0	0	to	59	0	0
Lithopone, 30% .....	ton	48	0	0	to	49	0	0
Magnesium chloride .....	ton	15	10	0	to	16	10	0
Carbonate, light .....	cwt	2	15	0	to	3	0	0
Sulphate (Epsom salts commercial) .....	ton	12	10	0	to	13	0	0
Sulphate (Druggists') .....	ton	18	10	0	to	19	10	0
Manganese, Borate .....	ton	190	0	0	to	—		
Sulphate .....	ton	130	0	0	to	135	0	0
Methyl acetone .....	ton	95	0	0	to	100	0	0
Alcohol, 1% acetone .....	gall.	Nominal.						
Nickel sulphate, single salt .....	ton	60	0	0	to	62	0	0
Nickel ammonium sulphate, double salt .....	ton	62	0	0	to	64	0	0
Potassium bichromate .....	lb.	0	1	8	to	0	1	9
Carbonate, 90% .....	ton	115	0	0	to	120	0	0
Chloride .....	ton	50	0	0	to	52	0	0
Chlorate .....	lb.	0	0	9½	to	0	0	10½
Meta bisulphite, 50-52% .....	ton	260	0	0	to	270	0	0
Nitrate, refined .....	ton	65	0	0	to	67	0	0
Permanganate .....	lb.	0	4	3	to	0	4	6
Prussiate, red .....	lb.	0	4	3	to	0	4	6
Prussiate, yellow .....	lb.	0	2	0	to	0	2	1
Sulphate, 90% .....	ton	31	0	0	to	33	0	0
Salammoniac, firsts .....	cwt.	5	10	0	to	—		
Seconds .....	cwt.	5	5	0	to	—		
Sodium acetate .....	ton	55	0	0	to	56	0	0
Arsenate, 45% .....	ton	60	0	0	to	62	0	0
Bicarbonate .....	ton	10	10	0	to	11	0	0
Bichromate .....	lb.	0	1	4	to	0	1	5
Bisulphite, 60-62% .....	ton	50	0	0	to	52	10	0
Chlorate .....	lb.	0	0	5	to	0	0	5½
Caustic, 70% .....	ton	32	0	0	to	33	0	0
Caustic, 76% .....	ton	34	10	0	to	35	0	0
Hydrosulphite, powder, 85% .....	lb.	0	4	0	to	0	4	6
Hyposulphite, commercial .....	ton	35	10	0	to	37	10	0
Nitrite, 96-98% .....	ton	87	10	0	to	90	0	0
Phosphate, crystal .....	ton	47	0	0	to	49	0	0
Perborate .....	lb.	0	2	2	to	0	2	4
Prussiate .....	lb.	0	1	2½	to	0	1	3½
Sulphide, crystals .....	ton	30	0	0	to	32	0	0
Sulphide, solid, 60-62% .....	ton	52	10	0	to	55	0	0
Sulphite, cryst. ....	ton	15	10	0	to	16	10	0
Strontium carbonate .....	ton	85	0	0	to	90	0	0
Nitrate .....	ton	90	0	0	to	95	0	0
Sulphate, white .....	ton	8	10	0	to	10	0	0
Sulphur chloride .....	ton	42	0	0	to	44	10	0
Sulphur, Flowers .....	ton	19	0	0	to	19	10	0
Roll .....	ton	19	0	0	to	19	10	0
Tartar emetic .....	lb.	0	3	2	to	0	3	4
Tin perchloride, 33% .....	lb.	0	2	6	to	0	2	7
Perchloride, solid .....	lb.	0	3	0	to	0	3	3
Protochloride (tin crystals) .....	lb.	0	2	0	to	0	2	1
Zinc chloride, 102 Tw. ....	ton	22	0	0	to	23	10	0
Chloride, solid, 96-98% .....	ton	60	0	0	to	65	0	0
Oxide, 99% .....	ton	72	10	0	to	75	0	0
Oxide, 94-95% .....	ton	60	0	0	to	62	10	0
Dust, 90% .....	ton	90	0	0	to	92	10	0
Sulphate .....	ton	21	10	0	to	23	10	0

## Coal Tar Intermediates, &amp;c.

	per	£	s.	d.	to	£	s.	d.
Alphanaphthol, crude .....	lb.	0	4	0	to	0	4	3
Alphanaphthol, refined .....	lb.	0	5	6	to	0	5	9
Alphanaphthylamine .....	lb.	0	3	9	to	0	4	0
Aniline oil, drums extra .....	lb.	0	1	8	to	0	1	9
Aniline salts .....	lb.	0	1	10	to	0	2	0
Anthracene, 85-90% .....	lb.	—			to	—		
Benzaldehyde (free of chlorine) .....	lb.	0	5	9	to	0	6	0
Benzidine, base .....	lb.	0	13	6	to	0	14	0
Benzidine, sulphate .....	lb.	0	10	6	to	0	11	0
Benzoic acid .....	lb.	0	5	3	to	0	5	6
Benzoate of soda .....	lb.	0	5	3	to	0	5	6
Benzyl chloride, technical .....	lb.	0	2	0	to	0	2	3
Betanaphthol benzoate .....	lb.	1	6	0	to	1	7	6
Betanaphthol .....	lb.	0	4	9	to	0	5	0
Betanaphthylamine, technical .....	lb.	0	11	6	to	0	12	6
Croceine Acid, 100% basis .....	lb.	0	5	0	to	0	6	3
Dichlorobenzol .....	lb.	0	0	6	to	0	0	7
Diethylaniline .....	lb.	0	7	9	to	0	8	6
Dinitrobenzol .....	lb.	0	1	4	to	0	1	5
Dinitrochlorobenzol .....	lb.	0	1	5	to	0	1	6
Dinitronaphthalene .....	lb.	0	1	6	to	0	1	8
Dinitrotolual .....	lb.	0	1	8	to	0	1	9
Dinitrophenol .....	lb.	0	2	9	to	0	3	0
Dimethylaniline .....	lb.	0	5	9	to	0	6	0
Diphenylamine .....	lb.	0	5	0	to	0	5	3
H-Acid .....	lb.	0	14	6	to	0	15	0
Metaphenylenediamine .....	lb.	0	5	9	to	0	6	0
Monochlorobenzol .....	lb.	0	0	10	to	0	1	0
Metanilic Acid .....	lb.	0	7	6	to	0	8	6
Monosulphonic Acid (2:7) .....	lb.	0	7	6	to	0	8	0
Naphthionic acid, crude .....	lb.	0	5	6	to	0	6	0
Naphthionate of Soda .....	lb.	0	6	0	to	0	6	3
Naphthylamine-di-sulphonic acid .....	lb.	0	5	6	to	0	6	6
Nitronaphthalene .....	lb.	0	1	6	to	0	1	8
Nitrotolual .....	lb.	0	1	3	to	0	1	4
Orthamidophenol, base .....	lb.	0	18	0	to	1	0	0
Orthodichlorobenzol .....	lb.	0	1	1	to	0	1	2
Orthotoluidine .....	lb.	0	2	6	to	0	2	9
Orthonitrotolual .....	lb.	0	1	3	to	0	1	4
Para-amidophenol, base .....	lb.	0	12	6	to	0	13	0
Para-amidophenol, hydrochlor .....	lb.	0	13	0	to	0	13	6
Paradichlorobenzol .....	lb.	0	0	6	to	0	0	8
Paranitraniline .....	lb.	0	8	0	to	0	8	3
Paranitrophenol .....	lb.	0	2	9	to	0	3	0
Paranitrotolual .....	lb.	0	5	9	to	0	6	0
Paraphenylenediamine, distilled .....	lb.	0	13	6	to	0	14	6
Paratoluidine .....	lb.	0	8	6	to	0	9	6
Phthalic anhydride .....	lb.	0	4	9	to	0	5	0
R. Salt, 100% basis .....	lb.	0	4	0	to	0	4	2
Resorcin, technical .....	lb.	0	11	6	to	0	12	6
Resorcin, pure .....	lb.	1	2	6	to	1	5	0
Salol .....	lb.	0	6	9	to	0	7	0
Shaeffer acid, 100% basis .....	lb.	0	3	6	to	0	3	0
Sulphanilic acid, crude .....	lb.	0	1	8	to	0	1	9
Tolidine, base .....	lb.	0	10	6	to	0	11	6
Tolidine, mixture .....	lb.	0	3	0	to	0	3	6

## Alsation Potash

During the past week French potash salts were quoted at prices approximate to those of the previous week.

## Cardiff By-Product Market

Wednesday, September 29.

Sulphate of Ammonia—	
For home consumption (per ton) .....	£24 d./d.
For export (per ton f.o.b.) .....	£30 to £40
Benzol, 90's (per gallon) .....	3s. 5d. to 3s. 10d.
Benzol, 50's (per gallon) .....	3s. 5d.
Solvent Naphtha (per gallon) .....	3s. to 3s. 6d.
Heavy Naphtha (per gallon) .....	3s. 3d. to 3s. 6d.
Crude Naphthalene Salts (per ton) .....	£16 to £26
Pitch (per ton) .....	200s. to 220s.
Creosote (per gallon) .....	1s. 2d. to 1s. 4d.
Motor Benzol (per gallon) .....	3s. 5d. to 3s. 10d.
Crude Benzol (per gallon) .....	2s. 10d. to 3s.
Toluol (per gallon) .....	4s.

## Recent Wills

Mr. J. S. MacArthur, mining engineer and metallurgical chemist, Pollokshields .....

£37,771

## Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for any errors that may occur.

### London Gazette

#### Partnership Dissolved

PARKER, GUSTAV CARL, OXLEY, MARY, and NAUE, FREDERICK HERBERT CURT, chemical merchants, 38, Lime Street, London, under the style of Parker, Oxley & Naue, by mutual consent as from September 7. The business will be carried on by G. C. Parker, who will discharge the liabilities of the firm.

#### Notice of Intended Dividend

SWITHENBANK, HAROLD, 132, Beeches Road, West Bromwich, analytical chemist. October 13. Trustee, A. S. Culley, Official Receiver, Ruskjn Chambers, 191, Corporation Street, Birmingham.

#### Companies Winding Up Voluntarily

GLOBE GLASS WORKS, LTD.—A. Edwards, Capel House, 54, New Broad Street, London, Liquidator.

EUREXINE DRUG CO.—J. W. Massey, 46, Cherry Street, Birmingham, Liquidator.

SCIENTIFIC GLASS CO., LTD. T. E. Rowell, North Shields, Liquidator.

### Mortgages and Charges

[NOTE.—The Companies Consolidation Act, of 1908, provides that every Mortgage or Charge, as described therein, created after July 1, 1908, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every Company shall, in making its Annual Summary, specify the total amount of debts due from the Company in respect of all Mortgages or Charges which would, if created after July 1, 1908, require registration. The following Mortgages and Charges have been so registered. In each case the total debt, as specified, in the last available Annual Summary, is also given—marked with an \*—followed by the date of the Summary, but such total may have been reduced since such date.]

BARNESLEY CHEMICAL CO., LTD.—Registered September 15, £10,000 debentures; general charge. \*Nil. July 10, 1919.

COAL, PEAT & OIL, LTD., DONCASTER.—Registered September 18, second mortgage securing all moneys owing under a guarantee to the extent of £1,000 and £275 advanced to the company, to J. Hanson, 160, Almond-bury Bank, Huddersfield, and others; charged on land at Haslington.

### Bill of Sale

[The undermentioned information is from the Official Registry. It includes Bills of Sale registered under the Act of 1882 and under the Act of 1878. Both kinds require re-registration every five years. Up to the date the information was obtained it was registered as given below; but payment may have been made in some of the cases, although no notice had been entered on the Register.]

BAINES, RICHARD, 50, Ancaster Road, Liverpool, medical dispenser. Filed September 21, £50.

LANE, J., 62, Great Crosshall Street, and 1, Scotland Place, Liverpool, iron, zinc and tinsplate worker. Filed September 27, £30.

### New Companies Registered

The following have been prepared for us by Jordan & Sons, Ltd., company registration agents, 116 and 117, Chancery Lane, London, W.C. :-

WEST NORFOLK FARMERS' MANURE AND CHEMICAL CO. (1920), LTD.—Manufacturers of artificial manures, cattle foods and chemicals. Nominal capital, £350,000 in 350,000 ordinary shares of £1 each. Minimum subscription, seven shares. Directors: To be appointed by subscribers. Qualification of directors, other than first directors, £500. Remuneration of directors, £2,000 to be divided. Subscribers: H. W. Hill and E. King, and five others.

ROBERTS, C. & CO., LTD., 4, Vincent Street, Bradford.—Manufacturers of chemical dyes, dyestuffs. Nominal capital, £50,000 in 10,000 preference shares and 40,000 ordinary shares of £1 each. Director: C. Roberts (governing director). Qualification of directors, one share.

CALDWELL'S PAPER MILL CO., LTD., 119-120, London Wall, E.C. 2.—Paper and pulp manufacturers. Nominal capital £300,000 in 300,000 ordinary shares of £1 each. Minimum subscription, seven shares. Directors: Sir R. W. Carlyle (chairman), Lord Morris (vice-chairman), A. Smith (managing director), A. W. Smith (assistant managing director), T. T. McCrow, A. Kay, and E. Simpson. Qualification of directors: £1,000. Remuneration of directors £300 each; chairman £500; vice-chairman £400.

BARLOW, F. R. & COMPANY, LTD., 37, Market Place, Devizes, Wilts. Chemists and druggists. Nominal capital £2,000 in 2,000 shares of £1 each. Directors: F. J. Summerton and Gladys De Bank Summerton. Qualification of directors, £50.

KINSON MANUFACTURING CO., 147, Minories, E. 1.—Chemists and druggists, &c. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: J. R. Caldwell, B. P. Davidson, and E. Donaghy. Qualification of directors, one share.

MELBODEL SYNDICATE, LTD., 45, Priestgate, Peterborough.—Investigating scientific principles, and applying the same to industry. Nominal capital, £1,000 in 1,000 ordinary shares of £1 each. Directors: S. L. Elborne, G. H. Boden, and W. T. Mellows. Qualification of directors, £100.

THAKE, F. S., LTD., 191, Bishopsgate, S.E. 3.—Manufacturers of chemicals, dyes, and general produce. Nominal capital, £1,000 in 1,000 shares of £1 each. Directors: F. S. Thake and H. Burrell. Qualification of directors, one share.

THOMAS, EDWIN R. & CO., LTD.—Dispensing and agricultural chemists and druggists. Nominal capital, £1,500 in 1,500 shares of £1 each. Directors: Eleanor Thomas and Ellen Thomas. Qualification of directors, £10.

### County Court Judgments

[NOTE.—The publication of extracts from the "Registry of County Court Judgments" does not imply inability to pay on the part of the persons named. Many of the judgments may have been settled between the parties or paid. Registered judgments are not necessarily for debts. They may be for damages or otherwise, and the result of bona-fide contested actions. But the Registry makes no distinction of the cases. Judgments are not returned to the Registry if satisfied in the Court books within twenty-one days. When a debtor has made arrangements with his creditors we do not report subsequent County Court judgments against him.]

STANSFIELD, J. L., Boothfold, Waterfoot, near Manchester. Chemical manufacturer. £15 6s. 5d. August 16.

### Benn Brothers Journals

Some Features of the Current Issues

#### AERONAUTICS.

"R.A.F. Civil and Military"; "Screw Propellers," by M. A. S. Riach, F.A.S.

#### THE CABINET MAKER.

"Pre-War Prices of Furniture"; "Modern Cane Furnishing"; "Association Work in the Cane and Willow Trade."

#### THE ELECTRICIAN.

"The Design of Interval Transformers," by J. K. Catterson-Smith; "Modern Marine Problems in War and Peace," by Dr. C. V. Drysdale; "The Woman in the Progress Department," by W. J. Hiscox.

#### FARM AND HOME.

"What the Visitor sees in Lincoln" (with plan of trial area); "The Root Crop"; "Findon's Great Sheep Fair."

#### THE GAS WORLD.

A Special By-Product Coking Section; "The World's Trade in Thoria and Gas Mantles"; All the Gas News of the week.

#### GARDENING ILLUSTRATED.

"Watering Fruit Trees under Glass"; "The Mixed Border"; "Ferns in Windows."

#### THE HARDWARE TRADE JOURNAL.

"The Ironmonger's Storeroom"; "Safety First and Machine Tools"; "Hardware and Machining for South Africa."

#### WAYS AND MEANS.

"The Pathology of Industrial Unrest," by D. A. Bremner; "Anglo-Spanish Trade," by H. Charles Woods; "The Psychologist in Industry," by William Brown.

